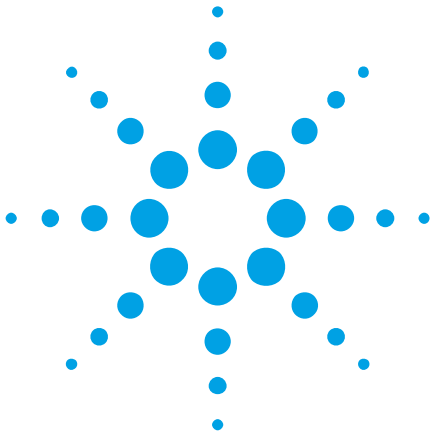

User Manual

Agilent Acqiris

10-bit Digitizers

Models covered:

DC122 / DC152 U1062A

DC222 / DC252 / DC282 U1065A

Agilent Technologies

Manual Part Number

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1. Out of the Box

1.1. Message to the User

Congratulations on having purchased an Agilent Technologies Acqiris data conversion product. Acqiris digitizers are high-speed data acquisition modules designed for capturing high frequency electronic signals. To get the most out of the products we recommend that you read this manual carefully. We trust the product you have purchased will meet with your expectations and provide you with a high quality solution to your data conversion applications.

1.2. Using this Manual

This guide assumes you are familiar with the operation of a personal computer (PC) running a Windows 2000/XP or other supported operating system. It also assumes you have a basic understanding of the principles of data acquisition using either a waveform digitizer or a digital oscilloscope.

The manual is divided into 5 separate sections. To understand the elements of operation for the module it is essential that you read them all.

Chapter 1	***OUT OF THE BOX,*** describes what to do when you first receive your new Acqiris product. Special attention should be paid to sections on safety, packaging and product handling. Before installing your product please ensure that your system configuration matches or exceeds the requirements specified.
Chapter 2	***INSTALLATION***, covers all elements of installation and performance verification. Before attempting to use your Acqiris product for actual measurements we strongly recommend that you read all sections of this chapter.
Chapter 3	***PRODUCT DESCRIPTION***, provides a full description of all the functional elements of the digitizer.
Chapter 4	***RUNNING THE ACQIRISLIVE APPLICATION***, describes the operation of AcqirisLive 3.2, an application that enables basic operation of Acqiris digitizers in a Windows 2000/XP environment. Note: **AcqirisMAQS** is an alternate software application offering many interesting possibilities for the control of acquisition systems in a single or multi-machine environment. Ask your sales representative or Agilent for more information.
Chapter 5	***RUNNING THE GEOMAPPER APPLICATION***, describes the purpose and operation of the GeoMapper application which is needed for some AS bus Multi-instrument systems.

For information necessary for writing your own software to control Acqiris products you should refer to the **Programmer's Guide** and the **Programmer's Reference Manual**.

1.3. Conventions Used in This Manual

The following conventions are used in this manual:

⚠	This icon to the left of text warns that an important point must be observed.
WARNING	Denotes a warning, which advises you of precautions to take to avoid being electrically shocked.
CAUTION	Denotes a caution, which advises you of precautions to take to avoid electrical, mechanical, or operational damages.
NOTE	Denotes a note, which alerts you to important information.
Italic	text denotes a warning, caution, or note.
Bold Italic	text is used to emphasize an important point in the text or a note
`mono`	text is used for sections of code, programming examples and operating system commands.
B,KB,MB,GB	is for Byte, KiloByte = 1024 bytes, MegaByte = 1024*1024 bytes, GigaByte = 1024*1024*1024 bytes

1.4. Model Names

Agilent Technologies Inc. acquired Acqiris SA and its product lines in December 2006. Use the tables below to cross reference the legacy model name and new Agilent numbers

Agilent Model Number	Acqiris Model Name
U1062A	DC122
U1062A	DC152
U1065A	DC222
U1065A	DC252
U1065A	DC282

1.5. Disclaimer and Safety

The 10-bit DC Series CompactPCI/PXI digitizers have been designed to operate inside a CompactPCI/PXI crate. The crate provides the modules with all needed power. Agilent does not recommend operation of the DC Series modules outside of a CompactPCI/PXI crate.

⚠ ***CAUTION:*** ***Do not exceed the maximum input voltage rating! The maximum input voltage for 50 Ω input impedance is ±5 V. The maximum input for 1 MΩ input impedance is ±300 V (dc + ac).***

1.6. Warning Regarding Medical Use

The Digitizer cards are not designed with components and testing procedures that would ensure a level of reliability suitable for use in treatment and diagnosis of humans. Applications of these cards involving medical or clinical treatment can create a potential for accidental injury caused by product failure, or by errors on the part of the user. These cards are ***not*** intended to be a substitute for any form of established process or equipment used to monitor or safeguard human health and safety in medical treatment.

⚠ ***WARNING:*** ***The modules discussed in this manual have not been designed for making direct measurements on the human body. Users who connect an Acqiris module to a human body do so at their own risk.***

1.7. Packaging and Handling

Your Digitizer is shipped with the following components:

- A compact disc in an Agilent Technologies paper CD envelope that includes
  - 10 product User Manuals in electronic form (8-bit Digitizers, 10-bit Digitizers, 12-bit Digitizers, Averagers, Analyzers, Signal Analyzers, Streamer Analyzers, Time-to-Digital Converters, 3-, 5-, and 8-slot CompactPCI Crates, and the 21-slot CompactPCI Crate),
  - 1 Programmer's Guide and 1 Programmer's Reference Manual,
  - device drivers with sample software for different operating systems, environments and languages,
  - the AcqirisAnalyzers application, a demonstration program for the AC/SC Analyzer products,
  - the AcqirisLive application, a demonstration program for our digitizer and averager products,
  - the DemoSSR application, a demonstration program for the Acqiris AP235/AP240 Analyzers,
  - the DemoAPX01 application, a demonstration program for the Acqiris AP101/AP201 Analyzers,
  - the DemoTC application, a demonstration program for the Acqiris TC840/TC890 Time-to-Digital Converters,
  - full installation procedures for use with Microsoft Windows, National Instruments LabVIEW RT, Wind River VxWorks, IVI-COM/C, and Linux software.
- A declaration of conformity
- Optional documentation such as a model-dependent document giving Specifications & Characteristics, a Calibration Certificate, or a Performance Verification

After carefully unpacking all items, inspect each to ensure there are no signs of visible damage. Also check that all the components received match those listed on the enclosed packing list. Agilent cannot accept responsibility for missing items unless we are notified promptly of any discrepancies. If any items are found to be missing or are received in a damaged condition please contact the Agilent service center or your local supplier immediately. Retain the box and packing materials for possible inspection and/or reshipment.

1.8. Warranty

All Agilent Acqiris Digitizer products are warranted to operate within specification, assuming normal use, for a period of at least one year from the date of shipment. Units sold before April 2008 had three year warranties, as do some more recent ones; in case of doubt examine your invoice. It is recommended that yearly calibration be made in order to verify product performance. All repairs, replacement and spare parts are warranted for a period of 3 months. Warranty extensions are available as an option.

Agilent endeavors to provide leading edge technology that includes the latest concepts in hardware and software design. As such software and firmware used with the products is under continual refinement and improvement. All software and instrument firmware is supplied "as is" with no warranty of any kind. Software and firmware is thoroughly tested and thought to be functional at the time of shipment. At Agilent's discretion software and firmware may be revised if a significant operational malfunction is detected.

In exercising this warranty, Agilent will repair or replace any product returned to the Agilent service center, within the warranty period. The warranty covers all defects that are a result of workmanship or materials. This excludes defects that are caused by accident, misuse, neglect, or abnormal operation.

The purchaser is responsible for returning the goods to the nearest Agilent service center. This includes transportation costs and insurance. Agilent will return all warranty repairs with transportation prepaid.

1.9. Warranty and Repair Return Procedure, Assistance and Support

Agilent acquired Acqiris SA and its product lines in December 2006. Please contact your nearest Agilent Service Center before returning any product for repair.

You can find information about technical and professional services, product support, and equipment repair and service on the Web, see http://www.agilent.com/find/service (or http://www.agilent.com/ and after selecting your country click on **Contact Us**). The service center will ask for your name, company, phone number and address, the model and serial numbers of the unit to be repaired, and a brief description of the problem.

Before issuing a Service Order the service center may ask you to communicate with us by phone or eMail so that we can learn as much as needed about the problems observed. If a unit returned under guarantee is found to be working normally and this procedure was not followed we reserve the right to charge you for the work done.

For your nearest customer support center please contact Acqiris Technical Support (ACQIRIS_SUPPORT@agilent.com) or come visit our web site at http://www.agilent.com/find/acqiris. Alternatively, contact Acqiris at 1-845-782-6544 in the USA, +41 22 884 32 90 in Europe or +61 3 9210 2890 in the Asia-Pacific region. The Agilent Support Centers can also help redirect you for any questions concerning the installation and operation of your equipment.

1.10. System Requirements

Acqiris products need the following minimum PC System Requirements in order to obtain reasonable performance from your digitizer

Processor: 150 MHz Pentium (higher recommended)

Memory: 64 MB RAM. The previous number is a very rough estimate. Assuming that you are using AcqirisLive or an application of your own that operates on the acquired data it seems reasonable to ask for 10 times the total acquisition memory that you will be using at the same time in the application. Performance is likely to be degraded if less memory is available.

Display resolution: At least 800 x 600 pixels and 256 colors for use of AcqirisLive or AcqirisDemo

Operating System: Microsoft Windows 2000/XP including 2003 Server, Wind River VxWorks 5.5.1 and 6.4, and Linux with kernels 2.4 and 2.6. Support for Windows 95/98/NT4 is included "as is" since these operating systems are no longer supported by Microsoft.

Hard Drive Space: 20 MB Minimum

CD Drive (or any method to copy the software installation files from CD to the hard drive such as LAN, floppy drive, etc.)

LabVIEW: A driver is available for National Instruments LabVIEW versions 7.1or 8.0

LabVIEW RT: A driver is available for National Instruments LabVIEW RT version 7.1 or higher. The VISA driver must be version 3.0 or higher.

MATLAB: The MEX interface can be used with MathWorks MATLAB 7.3 or a newer version.

Visual BASIC: The interface files and examples are available for Microsoft Visual Basic versions 5 or 6 and the interface files only for .NET.

Tornado: The example files are useable with Wind River Tornado 2.2.1

1.11. Transport & Shipping

⚠ ***CAUTION: Cards can be safely transported in their original shipping packages. DC cards can be transported when properly mounted in a CompactPCI crate.***

To package the instrument for shipping:

Step	Notes
1. Place the instrument in its original packaging materials.	• If the original packaging materials are not available, use a professional packaging service. Contact your Agilent Service Center for more information.
2. Surround the instrument with at least 3 to 4 inches (8 to 10 cm) of its original packing material or bubble-pack to prevent the instrument from moving in its shipping container.	
3. After wrapping it with packing material, place the instrument in its original shipping container or a strong shipping container that is made of double-walled corrugated cardboard with 159 kg (350 lb) bursting strength.	• The shipping container must be large and strong enough to accommodate your instrument and allow at least 3 to 4 inches (8 to 10 cm) on all sides for packing material.
4. Seal the shipping container securely with strong nylon adhesive tape.	
5. Mark the shipping container "FRAGILE, HANDLE WITH CARE" to help ensure careful handling.	
6. Use the address obtained from your Agilent Service Center.	
7. Retain copies of all shipping papers.	

⚠ ***CAUTION: Damage can result if the original packaging materials are not used. Packaging materials should be anti-static and cushion the instrument on all sides. NEVER USE STYRENE PELLETS IN ANY SHAPE AS PACKAGING MATERIALS. They do not adequately cushion the instrument or prevent it from moving in the shipping container. Styrene pellets can also cause equipment damage by generating static electricity or by lodging in fan motors.***

1.12. Maintenance

The cards do not require any maintenance. There are no user serviceable parts inside. A periodic calibration can be obtained on request.

1.13. Cleaning

Cleaning procedures consist only of exterior cleaning.

Clean the exterior surfaces of the module with a dry lint-free cloth or a soft-bristle brush. If any dirt remains, wipe with a cloth moistened in a mild soap solution. Remove any soap residue by wiping with a cloth moistened with clear water. Do not use abrasive compounds on any parts.

1.14. Disposal and Recycling

Electronic equipment should be properly disposed of. Acqiris digitizers and their accessories must not be thrown out as normal waste. Separate collection is appropriate and may be required by law.

2. Installation

This chapter describes how to install the Acqiris hardware and software for Windows 2000/XP, Linux, National Instruments LabVIEW RT, Linux, or Wind River VxWorks.

⚠ ***NOTE:*** *For a first time installation we strongly recommend installing the software* ***before*** *inserting the hardware into the PC.*

2.1. U1091AK02 IC414 Installation

⚠ ***NOTE:*** *If you are going to install an IC414 interface for the first time and are running Windows 2000 or XP you should follow the procedure below* ***before*** *installing the Acqiris hardware.*

2.1.1. IC414 Hardware installation hints

The PCI-8570/PXI-8570 User's Manual (Rev. 1.00) section 2.5 gives Hardware Installation instructions.

⚠ ***CAUTION***: ***Turn off the power of the PC; the PC may have to be unplugged to ensure that the PCI bus has no power available.*** Please ignore the PCI-8570 instruction to leave the power cord plugged in; Ground the chassis differently!

⚠ ***CAUTION:*** ***Touch the antistatic package to a grounded object before removing the card from the package. Electrostatic discharge can damage the card.***

The standard cable pair provided each have a red connector on one end and a black connector on the other. Therefore the correct connection can be made by plugging the Red connector into the L0Rx socket and the Black connector into the L0Tx socket on the PXI module and the other Red connector into the PCI module socket furthest from the PCI card internal base connector and the Black connector into the next socket.

If you intend to use 64-bit 66 MHz transfer to maximize data transfer speed you should cable a “bundled link”, using two standard cable pairs and both the L0 and L1 pairs of connectors. You should also make sure that you configure the PXI-8570 M66EN Jumper correctly.

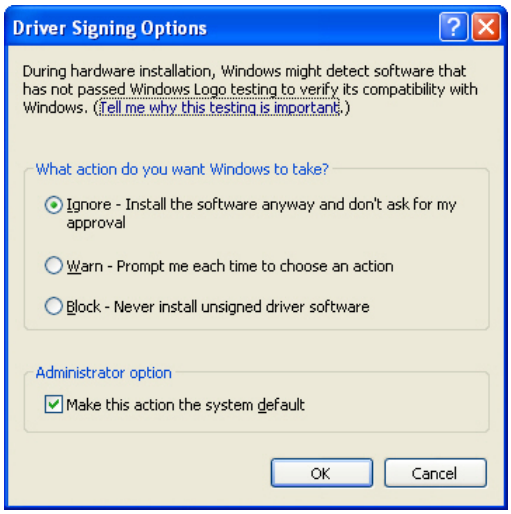
2.1.2. IC414 Windows software installation

Linux users do not need to read any further since there is no special software installation.

Windows users should have the hardware installed as noted above. This software installation should be done before any Acqiris modules are placed in the CompactPCI crates. This may mean that you have to remove the module from the crate *as delivered*.

The crate should be turned on first followed by the PC. If the cabling and start-up sequence is done correctly there will be no LED illuminated on the PCI unit connected pair and the LED's of the PXI connected pair will be lit.

For **Windows XP** installation, Select the **Control Panel** under Settings in the **Start** menu. Then, if you are using the **Category View** select **Printers and Other Hardware.** After this, for both **Category** and **Classic** views, go to **System** and then display the **Hardware** tab to get access to the **Driver Signing** menu. Since neither the AdLink nor the Acqiris driver has been submitted for **Windows Logo testing** you must select either the **Ignore** or **Warn** action. The resulting menu looks as shown:


Driver Signing Options
During hardware installation, Windows might detect software that has not passed Windows Logo testing to verify its compatibility with Windows. (Tell me why this testing is important.)
What action do you want Windows to take?
Ignore - Install the software anyway and don't ask for my approval
Warn - Prompt me each time to choose an action
Block - Never install unsigned driver software
Administrator option
Make this action the system default
OK
Cancel

The PCI-8570/PXI-8570 User's Manual (Rev. 1.00) section 2.4 contains the software installation instructions. These should be executed before allowing the hardware installation process to look for the driver. If you have an AdLink CD Version 2004A4 or later you can use it; if not you should download the latest driver from the WEB site (http://www.adlinktech.com/). You can then continue with the Hardware Installation. A reboot will then be necessary. At this point the Stargen Fabric PCI Adapter and the Stargen Aruba Fabric-to-PCI Bridge should appear correctly installed under System Devices in the Device Manager.

⚠ ***NOTE:*** If you have an AdLink CD Version 2005A3 or later you can find 8570install.exe in the folder X:\Driver Installation\PXI Platform\PXI Extension\PCI_PXI-8570\Wnt2kxp and the starfab1.inf file in the folder X:\Driver Installation\PXI Platform\PXI Extension\PCI_PXI-8570\Win98.

2.2. Installing the Software under Windows

2.2.1. Warnings

If Setup detects a previous installation of Acqiris software on your system, a warning screen will be displayed. It is recommended to exit Setup and uninstall older versions.

The installer from software releases prior to **Acqiris Software 2.0** installed the Digitizer Driver DLL files into the System directory. These will be removed by Setup. If you wish to keep the old installation on your system, you should exit Setup, and move all Acqiris driver files (acqiris*, acqrs* and acqir*) to some archive directory.

The DLL files will be installed into the bin subdirectory of the Acqiris software root, and the corresponding path will be added to the PATH environment variable.

2.2.2. Multiple Versions

With the software installation from **Acqiris Software 2.0** (or above), it is possible to keep multiple versions on the same system, but you must specify a different root directory (i.e. Install Folder). If you keep the same directory, Setup will overwrite your previous installation.

To go back to a previous version, you must change the PATH environment variable and reinstall the Kernel driver. Note that the 10-bit instruments are not supported by Kernel versions before 1.8 which was part of Acqiris Software 2.13c. Under Windows 2000/XP,

1. Copy the SYS file from `<old_AcqirisSoftware_root>\bin\kernel` to the `Windows\System32\drivers` directory.
2. Change the AcqirisDxRoot, AcqirisDxDir and PATH environment variables to the old root.
3. Reboot the computer.

2.2.3. Installation

Before installing the Acqiris hardware, you should complete the following steps to install the software for Windows 2000/XP.

⚠ ***NOTE:*** *You will need administrator privileges to complete the software installation under Windows 2000/XP.*

1. Insert the *Acqiris Software CD* into the CD-ROM drive of your computer. If the Autorun program does not start automatically (Autoplay disabled), you can start it manually, or navigate to the *AcqirisSoftware\Windows* folder in order to display the files included.
2. Choose **Install AcqirisSoftware for Windows 2000/XP/2003 Server** (or run `Setup.exe` from the *AcqirisSoftware\Windows* folder). After several seconds for initialization the first of many screens will appear.

Please note the following points:

- It is good practice to remove any previously installed version o0f Acqiris software. If the program finds that there is still Acqiris software installed on your machine a warning panel will appear.
- In the **Select Install Type** window selecting **Custom** installation will let you select individual packages for loading. The space indicated for LabVIEW, Firmware and UserManual packages is incorrect. The correct values are 7 MB, 40 MB, and 30 MB respectively. A full installation requires just under 150 MB of disk.

- If MATLAB is installed on your machine, you will be asked to point the installer to the MATLAB root directory. You should do this if you want the installer to modify the standard startup.m file to incorporate the Acqiris adaptor.
- In the **Installation Folder** window you will give the name of the root directory of the Acqiris software installation. If User Manuals (30 MB) and Firmware (40 MB) are loaded more space than indicated here will be required on the drive. For the case of a Tornado 2.2 installation the folder name should not contain any spaces.
- AcqirisLive needs the LabWindows/CVI 7.0 Run-Time Engine to run. If Setup has detected that a LabWindows/CVI Run-Time Engine is already installed on your system, it will ask you if you would like to install it locally for AcqirisLive anyway. If you are not sure about the version of the CVI Run-Time Engine on your system, it is recommended to install it locally.
- The **Installation Summary** window will be shown to allow you to check what you have asked for. At this point it is not too late to go back and make changes. The actual installation will only be started after clicking on "Install" in the next window.
- Please read the **IMPORTANT Information** window text. It could help you avoid serious problems.
- Registration of your installation will help Agilent provide you with better support. You will also be notified of updates and upgrades. All information submitted will be treated in accordance with Agilent's privacy policy. Setup will prepare a registration e-mail in your e-mail client application upon termination of the setup procedure. You can then decide whether or not you wish to send it. You may also add comments. Uncheck the box if you do not want to register your installation.
- After the software installation is complete you can either accept the suggestion to restart the computer or you should shutdown your computer and proceed with the hardware installation.

2.3. Installing the Software for Linux

The Acqiris software is ready to install on Linux systems running kernels 2.4 and 2.6. The following archives all contain the driver and library compiled with the **gcc** version shown:

`AcqirisLinux-3.2a-gcc-3.3.tar.gz` - compiled under Debian 'sarge' 3.1 with gcc 3.3.

`AcqirisLinux-3.2a-gcc-3.4.tar.gz` - compiled under SL 4.4 with gcc 3.4.

`AcqirisLinux-3.2a-gcc-4.1.tar.gz` - compiled under Debian 'etch' 4.0 with gcc 4.1.

The appropriate tar file should be copied to a local directory (e.g. your home directory) and then unpacked by using the following command

```
tar xzf AcqirisLinux-3.2a-gcc-X.x.tar.gz
```

The resulting directory **AcqirisLinux** contains an install script **drv-install** and a graphical Demo program **demo/AcqirisDemo**. Before running the software you have to install the device driver into the running kernel.

2.3.1. Installing the Linux device driver

The **acqrsPCI** device driver is a loadable kernel module. It is provided both as source files and already compiled binary files for some kernel versions.

The compiled loadable kernel module is available for:

- Debian 'sarge' 3.1: kernel 2.6.8-3-686
- Suse Linux 9.2: kernel 2.6.8-24-smp
- Scientific Linux 4.4: kernel 2.6.9-42.0.10.EL-i686
- Debian 'etch' 4.0: kernel 2.6.18-4-686

For other Linux distributions, the loadable kernel module will have to be compiled from the sources.

Using a compiled kernel module

You can find the running version of your Linux kernel by running the command:.

```
uname -r
```

Then, if there is a kernel module that matches yours, you can rename the file:

```
cd AcqirisLinux/lib/modules
cp acqrsPCI.ko[.n] acqrsPCI.ko
```

where [.n] is the running version of the Linux kernel.

To install the device driver you have to rename the kernel module whose name matches the version of your kernel to a name without this version number.

Compiling the kernel module

All files needed to compile a new kernel mode driver are in `AcqirisLinux/linuxdriverpci` for Linux kernels 2.4, or `AcqirisLinux/linux2.6driverpci` for Linux kernels 2.6.

To compile the driver, the header files of the Linux kernel need to be installed. Furthermore, depending on the Linux distribution, the kernel source files may need to be installed too.

Compiling for Linux kernels 2.6

The makefile will try to guess where the kernel headers are located. If it fails, see the instructions inside the makefile itself to specify manually where these kernel header files are located.

To compile a new kernel module, use the following commands:

```
cd linux2.6driverpci
make clean all          to generate a new kernel module from scratch
make install            to copy the kernel module where it should reside
                        (this last command require super user privileges).
```

In the end, the loadable kernel module should be present in the system's loadable kernel modules directory. You can verify that it is present by running:

```
ls -l /lib/modules/$(uname -r)/extra/acqrsPCI.ko
```

For Debian users, in order to compile the kernel module on a system, the kernel packages that match the current kernel-image must be installed. For instance, on a Debian ‘etch’ 4.0 system 686 the required packages are:

```
linux-image-2.6-686
linux-image-2.6.18-4-686
linux-headers-2.6-686
linux-headers-2.6.18-4
linux-headers-2.6.18-4-686
linux-kbuild-2.6.18
```

Note that this version of the loadable kernel module had been tested on Linux kernel versions up to 2.6.18. However, starting with kernel 2.6.17, a few kernel functions relating to the device classes are no longer available to proprietary modules. Thus automatic creation of the `/dev/acqrsPCI` node has to be done manually in the `/etc/rc.local` file (see below).

Compiling for Linux kernels 2.4

The makefile will try to guess where they are located. If it fails, see the instructions inside the makefile itself to specify manually where these kernel header files are located.

The path variable `INCLUDEDIR` in the makefile has to point to the correct kernel header files. The default is `INCLUDEDIR=/usr/src/linux-2.4`. This path usually is a link to the actual header files (driver source). To compile for a new kernel, issue the following commands:

```
cd linuxdriverpci
make clean              to remove all *.o files in AcqirisLinux/linuxdriverpci.
Make                    to generate a new kernel mode driver acqrsPCI.o and
                        also copy it to the directory AcqirisLinux/lib/module
                        where the install script (drv_install) can access it.
drv-install rem         to remove the previous installed kernel mode driver.
drv-install add         to install the new driver.
```

In the end, the loadable kernel module should be present in the system's loadable kernel modules directory. You can verify that it is present by running:

```
ls -l /lib/modules/$(uname -r)/ACQIRIS/acqrsPCI.o.
```

2.3.2. Loading the Linux device driver

To install the device driver and the load script to the system, you have to get super user privileges and execute the driver install script by typing,

```
cd AcqirisLinux
./drv-install add
```

You can check that the driver is loaded properly with **lsmod**.

```
/sbin/lsmod | grep acqrsPCI
```

If **lsmod** does not report a module named acqrsPCI, then the kernel module is not loaded into the kernel. Read the section below.

You can check that a device node has been created.

```
ls -l /dev/acqrsPCI
```

If the device node `/dev/acqrsPCI` is not present on your system, the Acqiris Software will not be able to access the device. Read more in the section below.

The **drv-install** script has the following additional functionality:

`drv-install rem`	to remove the driver and load script
`drv-install res`	to restart the driver

Loading the module into the kernel

If you are running a Linux distribution that does not use the standard paths for the load scripts, you have to load the device driver manually.

The kernel module should be present in the kernel modules directory. Check with the following command:

```
ls -l /lib/modules/$(uname -r)/extra/acqrsPCI.ko
```

First update the kernel modules dependencies:

```
/sbin/depmod -a
```

Then load the kernel module:

```
/sbin/modprobe -v /lib/modules/$(uname -r)/extra/acqrsPCI.ko
```

The acqrsPCI kernel module should now be loaded correctly. Check with **lsmod**.

You can add the command above to your `/etc/rc.local` file. It is run at system startup and will load the acqrsPCI kernel module automatically when your computer is restarted.

Creating the device driver node

For systems using udev (the dynamic `/dev/` hierarchy) or running kernels above 2.6.17, the device driver node may not be created automatically. You can do it with **mknod** running the following command:

```
/bin/mknod -m 666 /dev/acqrsPCI c 124 0
```

You can check that the device node has been created:

```
ls -l /dev/acqrsPCI
```

You can add the **mknod** command to your `/etc/rc.local` file. It is run at system startup and will create the `/dev/acqrsPCI` device node automatically when your computer is restarted.

Note that the permissions that are set in this example (-m 666) gives access to the Acqiris instruments to all the users. This may not be what you expect and these permissions can be adjusted to fit your requirements. The basic rule is that any user that wants to use the Acqiris instruments has to get read and write access to `/dev/acqrsPCI`.

2.3.3. Environment variables for the Firmware

Automatic loading of the firmware needed by 12-bit, analyzer, and averager modules relies on the environment variable **AcqirisDxDir** pointing to the directory containing the file **AqDrv4.ini** which in turn points to the directory containing the Firmware **.bit** files. Therefore, assuming that your Firmware is in **/usr/local/AcqirisLinux/Firmware** and that **AqDrv4.ini** is in **/usr/local/AcqirisLinux/demo** then you must edit **AqDrv4.ini** so that it contains the line

fpgaPath=/usr/local/AcqirisLinux/Firmware

Then, if your shell is **csh** or **tcsh** modify the **/etc/csh.login** file to contain the line

setenv AcqirisDxDir /usr/local/AcqirisLinux/demo

or, if your shell is **bash, ksh, zsh** or **sh**, modify the **/etc/profile** file to contain the lines

AcqirisDxDir=/usr/local/AcqirisLinux/demo

export AcqirisDxDir

2.4. Installing the Hardware

1. Turn off the power of the PC and the crate in the case of a CompactPCI module.

⚠ ***CAUTION:*** ***For PCI modules the PC may have to be unplugged to ensure that the PCI bus has no power available. However, CompactPCI crates can be left plugged in since this ensures proper grounding.***

⚠ ***CAUTION:*** ***Touch the antistatic package to a grounded object before removing the card from the package. Electrostatic discharge can damage the card.***

2. Module in a CompactPCI crate: Follow the instructions of the crate manufacturer to insert the DC Series card into a free CompactPCI peripheral slot. Be sure to ground yourself by touching the grounded crate and avoid touching any components on the DC Series card. Be sure to tighten both front panel mounting screws to lock the module into place and insure proper grounding of the frame.

⚠ ***NOTE:*** *To ensure the best possible performance, users of Acqiris CC121 Crates with AS bus 2 systems should respect the module placement rules to be found in the Acqiris CC121 CompactPCI Crate User Manual.*

3. Turn on the power of the crate(s), and then the PC and start the operating system.

⚠ ***NOTE:*** *Acqiris digitizers are equipped with a LED. If this LED is not glowing orange or red when the power is applied there is a severe problem. Either the module is broken or the necessary voltages for its use are not available.*

⚠ ***NOTE:*** *For proper system operation when using the IC200, IC414, or other PCI extension interface to connect a CC10X crate to a remote PC, the crate* ***must*** *be powered on before the PC in order for the PC BIOS to recognize the presence of the CompactPCI crate.*

4. If devices were installed using a previous version of Acqiris software the instruments in these logical positions may still appear as *Unknown Devices*. This can be changed to the new Acqiris type category with the Grey Diamond icon by **Uninstall**ing the device and then **Installing** again. Instructions on this procedure can be found in the **ReadMe.txt** file in the **manuals** folder of your Acqiris software installation.

2.5. After Restarting

2.5.1. Windows 2000

Under Windows 2000, you *must* login with administrator privileges after the first boot following the hardware installation; the Plug&Play system must have the appropriate privileges to be able to complete your hardware installation successfully. After a successful hardware installation, you will be able to use your Acqiris digitizer(s) with normal privileges.

At the first boot following the hardware installation, Windows will detect the new hardware and will install the devices automatically. The following image will appear.

⚠ ***NOTE:*** *In some systems an application program (such as AcqirisLive) will not yet work correctly at this point. One additional boot cycle may be needed if this is the first time that a hardware board is being installed.*

2.5.2. Windows XP

Under Windows XP, you *must* login with administrator privileges after the first boot following the hardware installation; the Plug&Play system must have the appropriate privileges to be able to complete your hardware installation successfully. After a successful hardware installation, you will be able to use your Acqiris digitizer(s) with normal privileges.

If you login with administrator privileges after the first boot following the hardware installation, Windows will detect the new hardware and start the "Found New Hardware Wizard" after a few seconds. There is no need to use Windows Update to search for the software. You can "Install the software automatically". The final screen should appears as shown here:

Found New Hardware Wizard
Completing the Found New Hardware Wizard
The wizard has finished installing the software for:
Acqiris PCI Instrument

⚠ ***NOTE:*** *In some systems an application program (such as AcqirisLive) will not yet work correctly at this point. One additional boot cycle may be needed if this is the first time that a hardware board is being installed.*

2.6. LabVIEW RT

During program development you can choose whether you use LabVIEW or LabVIEW RT compatible libraries by switching the version present in **National Instruments\LabVIEW m.n\instr.lib**. This swap can be facilitated by using the **Install VI library for LabVIEW or LabVIEW Real-Time** shortcut available in the Shortcut folder under **Start** → Programs.

There is only one Acqiris Driver. It supports all Acqiris Instruments. The instructions below concern LabVIEW RT as used in NI PXI processors.

The Aq_RT.inf and AqRT_4.ini files must be uploaded to the target. To do this,

- start the MAX application,
- right click on the target
- select file transfer
- select the Aq_RT.inf file on your host machine and upload ('To Remote') to the LabVIEW RT working directory (/NI-RT/system) on the target
- select the Aq_RT.ini file on your host machine and upload ('To Remote') to the LabVIEW RT working directory (/NI-RT/system) giving it the name AqDrv4.ini

For Acqiris modules which need FPGA files you should,

- create the folder \firmware in the /NI-RT/system directory using the file transfer application
- select the FPGA files (from <AcqirisDxRoot>\Firmware) you want to copy to the target and upload them into the firmware directory

Restart the target after finishing the file transfers.

Restart the MAX Explorer and you should have Acqiris digitizers detected in your PXI system.

2.7. Installing the IVI-COM/C Driver

Please install Acqiris software for Windows first. Then the *Acqiris Software CD* Autorun program gives access to two installers:

- IVI Shared Components 1.4
- IVI-COM/C IviAqD1 driver

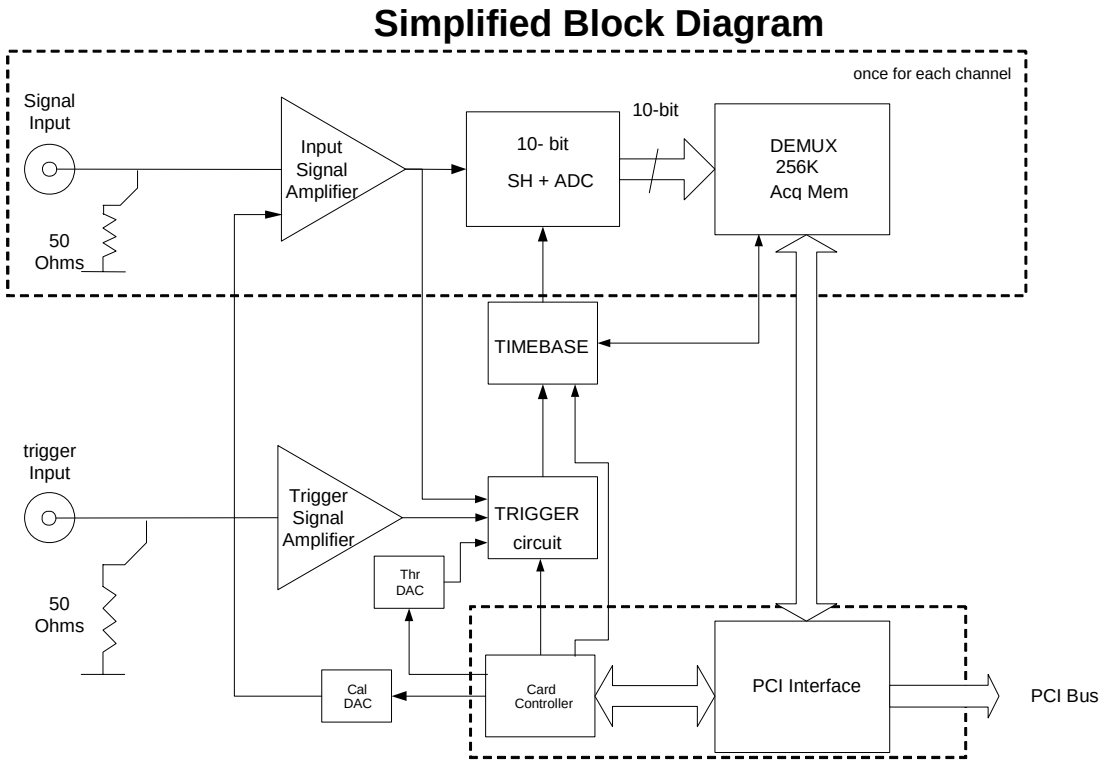
These must be installed in the order shown above. For more information you can then consult the Readme.txt file in the IVI\Drivers\IviAqD1 folder or the documentation through the program shortcut present under Ivi/IviAqD1.

2.8. Distribution for Windows 2000/XP and Linux

The manuals/ReadMe.txt file contains a list of files to be found after a complete installation of Acqiris software on Windows systems. Similarly the ReadMeLinux file gives the list of files corresponding to that installation.

3. Product Description

3.1. Overview



The 10-bit DC series products are CompactPCI/PXI compliant and require an appropriate CompactPCI crate. The digitizers are all fully programmable over the PCI bus and deliver oscilloscope-like performance. Data captured by the digitizers can be transferred to a host processor, either in the PC, in the crate, or interfaced to the crate, over the PCI bus. The 6U units (DC222, DC252, and DC282) can operate at 64-bit − 66 MHz with peak transfer speeds approaching 500 MB/s. The 3U units (DC122 and DC152) work at 32-bit − 33 MHz. The digitizers occupy a single slot of a 3U or 6U CompactPCI crate and they comply with the 3U or 6U CompactPCI standard (PXI compliant).

Acqiris digitizers are designed to provide superior measurement precision and accuracy. Key acquisition specifications (such as DC accuracy, integral and differential non-linearity) have been optimized to deliver maximum measurement fidelity. Careful circuit layout, custom IC's and special packaging techniques have all been employed to reduce overall system noise. The use of custom IC's also dramatically reduces the total number of discrete components required. This has tremendous benefits on reliability and also allows the modules to use a minimal amount of power.

For complete technical specifications concerning your particular digitizer please refer to the product's Specifications & Characteristics. In addition, we maintain up-to-date versions of all product data sheets on our web site (http://www.agilent.com/find/acqiris). The data sheets are available in pdf format and are best viewed using Adobe Acrobat software. If you have trouble accessing our web site, or viewing the data sheets, please contact your nearest sales office.

3.2. Channel Input

The 10-bit digitizer family can be configured with a variety of front-end mezzanine boards offering different capabilities. The currently available front end options are detailed below:

Front End Option	Impedance	Bandwidth Guaranteed (typical) / Risetime	BW Limiter selections	FS Voltage Ranges	Maximum Offset / *Max. Voltage*
Standard (Std)	**50 Ω**	2 GHz 0.17 ns	20, 200, 700 MHz	0.05 – 5.0 V	± 5 V *± 5 V*
High-Impedance (HZ)	**50 Ω**	950 MHz (1 GHz) 0.35 ns	20, 200, 700 MHz	0.05 – 5.0 V	± 5 V *± 5 V*
	1 MΩ	(300 MHz) 1.2 ns	20, 200 MHz (see remark below)	0.05 – 50 V	± 20 V (> 0.5 V FS) ± 200 V (> 5V FS) *± 300 V*
High-Frequency (HF)	**50 Ω**	3 GHz 0.12 ns		1 V	± 0.5 V *± 2 V*

A given unit's model number will indicate which front end option is installed. If nothing follows the number itself then the standard front end option is present.

Units can be ordered with BNC or SMA connectors.

For DC2x2HZ units and FS > 5 V, only the 20 MHz Bandwidth Limiter is available.

3.2.1. Standard & High Impedance Coupling

Both AC and DC coupling modes are available. The AC mode couples signals capacitively thus removing the input signal's DC component and filtering out any signal component below 16 Hz for the HZ option or 32 Hz for the Std option. DC mode allows all signal components to be passed through to the digitizer.

3.2.2. Impedance

The input channels of the 10-bit digitizer Family offer termination in either 50 Ω or 1 MΩ. The 50 Ω coupling mode for the Standard and High-Impedance front ends, offers high quality termination with better than ± 1% precision. It is ideally suited to use with 50 Ω transmission lines (coax), high bandwidth low impedance (typically 500 Ω) probes or active probes. The HF 50 Ω coupling mode has ± 2% precision The 1 MΩ coupling mode provides a high impedance (low load) capability that is suited for use with most standard high impedance probes. The high impedance mode also features low (14 pF typical) capacitance that helps to minimize loading effects that can occur when probing high frequency circuits.

3.2.3. Input Protection

The input amplifiers are protected against over-voltage signals as shown in the table. The High-impedance limit refers to the input signal's DC + peak AC < 10 KHz voltage.

3.2.4. Mezzanine Front-end

The front-end electronics are all mounted on a removable mezzanine card. In the event of accidental damage or as components fatigue over time (e.g. relays in high duty cycle automated testing applications), the mezzanine card allows for fast and efficient replacement.

3.2.5. Bandwidth and Rise Time

The bandwidth specification indicates the frequency at which an input signal will be attenuated by 3 dB (approximately 30% loss of amplitude). The bandwidth also affects the minimum rise and fall times that can be passed through the front-end electronics. A pulse with a very sharp edge will be observed to have a minimum rise time (τ_{min}) determined by the front-end electronics. In general a pulse with a given 10-90% rise time ($\tau_{10\text{-}90real}$) will be observed with a slower value given by:

$$\tau_{10\text{-}90}^2 = \tau_{10\text{-}90real}^2 + \tau_{min}^2 \qquad \text{where} \quad \tau_{min}\,(\text{ns}) \approx 0.35\ (\text{GHz-ns}) / \text{BW}\ (\text{GHz})$$

For the HZ option in 1 MΩ coupling the 700 MHz Bandwidth Limiter cannot be used. Furthermore, for FS gain > 5V the 200 MHz Bandwidth Limiter is always active.

3.2.6. Input Voltage and Offset

The input channel provides a fully programmable amplifier with variable input voltage and offset. Full Scale (FS) input voltages are selectable in a 1, 2, 5 sequence for the range shown above. Care should be taken to select an input voltage range that will allow the signal to be recorded using as much dynamic range of the digitizer as possible. The Variable Offset is programmable in the range of ±2 V when using an FS Input Voltage setting of 500 mV or below, increasing to ± Maximum Offset for FS settings above 500 mV (see the preceding table). The raw 10-bit ADC data values are read as 16-bit integers in the range [-32768, +32704] with nominal steps of 64 LSB's between successive codes and the first and last values reserved for underflow and overflow respectively. The midpoint value, 0, of the range corresponds to the negative of the offset voltage. Thus the Full Scale Range (FSR) goes from

–Offset Voltage **– (FS/2)** to –Offset Voltage **+ (FS/2)**

Signals going outside of the FSR will be clipped and data values for the clipped portion of a signal should be regarded as erroneous.

3.2.7. Vertical Resolution

The digitizers described in this manual use an ADC system with 10 bits of vertical resolution (1024 levels). The dynamic range of the ADC covers the Full Scale Range (FSR) of the Input Voltage setting. For example, if the Input Voltage is set to 1 V then the ADC resolution is equivalent to 0.977 mV. To obtain the best dynamic range from the ADC care should be taken to ensure that the input signal varies over more than 50% of the Input Voltage FSR setting.

3.2.8. DC Accuracy and Linearity

These 10-bit digitizers use low noise front-end electronics in order to ensure voltage measurement is made with accuracy and precision. DC voltage accuracy, at 0 V offset, is better than ±2% (±1% typical) of the input voltage full scale. The static differential nonlinearity is < 2 LSB. The integral linearity is good to ± 1 LSB (typical).

3.2.9. Using Probes

The 50 Ω and 1 MΩ input impedance settings make it possible to use Acqiris digitizers with a wide variety of probes. The 50 Ω setting is most commonly used for active probes and low impedance (500 Ω) passive probes. The 1 MΩ setting is normally used for high impedance probes. Before using any Passive Probe with a digitizer care should be taken to check that the probe has been correctly adjusted (refer to the Probe's Calibration procedure).

⚠ ***NOTE***: *Passive high impedance probes are not suitable for high fidelity measurements above 100 MHz. The non-negligible (5-10 pF) tip capacitance loads the signal causing distortion and/or ringing when combined with the ground lead inductance.*

3.3. Data Acquisition

The table below summarizes the characteristics discussed in the sections that follow:

Model Agilent #	**Max. Sampling Rate**	**Max. CONVERTERS PER CHANNEL/ CHANNELS**	**Default Memory Samples/ channel**	**Maximum Optional Memory Samples/ channel**	**Maximum Segments**
DC122 U1062A	4 GS/s	1 / 1	512K	512M	125K
DC152 U1062A	4 GS/s	2 / 2	256K	256M	125K
DC222 U1065A	8 GS/s	1 / 1	1024K	1G	125K
DC252 U1065A	8 GS/s	2 / 2	512K	512M	125K
DC282 U1065A	8 GS/s	4 / 4	256K	256M	125K

3.3.1. Sampling Rate

All Acqiris digitizers contain an analog-to-digital conversion (ADC) system that can sample waveforms, in a real time sampling mode, at rates from the maximum allowed rate down to 100 S/s (10 ms per point). The sampling rate can be programmed and is selectable in a 1, 2, 2.5, 5 sequence (i.e. 1 MS/s, 2 MS/s, 2.5 MS/s, 5 MS/s, 10 MS/s, … 1 GS/s, 2GS/s, 4 GS/s, 8 GS/s). The maximum sampling rate shown above exploits the possibility of combining channels.

3.3.2. Acquisition Memory

Data from the ADC is stored in on-board acquisition memory. The amount of memory in use for acquisition can be programmed and is selectable from 1 point to the full amount of acquisition memory available.

For technical reasons, a certain acquisition memory "overhead" is required for each waveform, reducing the available memory by a small amount. In order to simplify programming, an interface function recommends the best sampling rate and the maximum possible number of data points, taking into account the available memory, the requested time window, the number of segments (in Sequence mode), as well as the required memory overhead.

To ensure maximum sampling rate and high timing resolution, we strongly recommend the use of long acquisition memories whenever possible.

Optional Memory is available on most models. It allows the maximum number of segments to be increased significantly. However, this memory is divided into 2K sample pages and a segment must start at the beginning of the page. Additional memory is used for segment time stamps. These constraints must be kept in mind when trying to understand how the driver limits the number of points as the number of segments changes. Furthermore, multi-segment event readout must read entire pages for each ADC. This can introduce significant overhead for small segments and/or when channels are combined.

3.3.3. Single and Sequence Acquisition Modes

Digitizers acquire waveforms in association with triggers. Each waveform is made of a series of measured voltage values (sample points) that are made by the ADC at a uniform clock rate. The digitizer can also measure and store the arrival time of each trigger using the information from the on board Trigger Time Interpolator (TTI). Readout of the individual trigger time stamps makes it possible to determine the time from one trigger to any other trigger. Time differences up to 213 days can be measured. The TTI resolution sets the resolution of the trigger time stamps (see section 3.3.5 ***TIMING***). To maximize sampling rates and utilize memory as efficiently as possible, the digitizers include both Single and Sequential storage modes. For both of these modes the data of all of the active channels is acquired synchronously; all of the ADC's are acquiring data at the same time, to within a small fraction of the maximum sampling rate.

The Single Acquisition mode is the normal operation of most digitizer products. In this mode an acquisition consists of a waveform recorded with a single trigger. The user selects the sampling rate and acquisition memory size and sets the number of segments to 1 (default value).

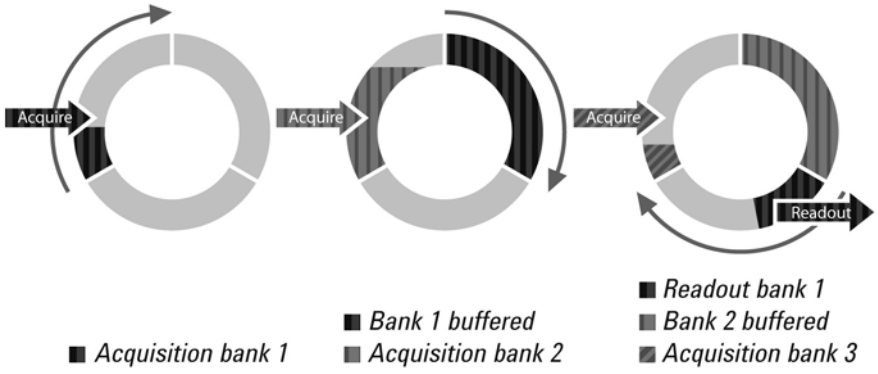
The Sequence Acquisition mode allows the capture and storage of consecutive "single" waveforms. Sequence Acquisition mode is useful as it can optimize the digitizer's sampling rate and memory requirements for applications where only portions of the signal being analyzed are important. The mode is extremely useful in almost all impulse-response type applications (RADAR, SONAR, LIDAR, Time-of-Flight, Ultrasonics, Medical and Biomedical Research, etc.).

In Sequence Acquisition mode the acquisition memory is divided into a pre-selected number of segments. Waveforms are stored in successive memory segments as they arrive. Each waveform requires its own individual trigger. The memory can be divided into any number of segments between 2 and 1000 (up to 16000 segments with the M32M option in a DC282 and 125000 segments with options M256M or greater). In Sequence Acquisition mode the user needs to specify the sampling rate, the total acquisition memory, and the number of segments. Note that the Single Acquisition mode is just a special case of the Sequence Acquisition mode with the number of segments set to 1.

Sequence acquisition enables successive events, which can occur within a very short time, to be captured and stored without loss. A crucial feature of Sequence Acquisition mode is that it has a very fast trigger rearm time. A fast trigger rearm helps produce very low "dead time" (< 350 ns for the highest available sampling rates using internal memory and < 1.8 µs for the highest available sampling rates with optional memory) between the segments of a sequence acquisition. The "dead time" is the period after the end of an event when the card cannot digitize data for a new trigger event.

3.3.4. Simultaneous multibuffer Acquisition and Readout (SAR)

The internal memory has a dual-port structure which can be exploited to permit simultaneous data acquisition and read out. The memory can be turned into a circular buffer of a chosen number of banks, between 2 and 1000. Data can be read out of one bank while data is acquired into any available free banks. This mechanism, together with sequence acquisition, helps achieve a high maximum continuous event rate in spite of interrupts due to the computer operating system. The maximum continuous event rate is the maximum value of the trigger frequency that can be accepted without the loss of any event. Note that this mode is available for internal memory only on single modules (no AS bus) and does not work for all cases of sampling rate and channel combination. It does not work if the 'Start on Trigger' mode of acquisition is selected. It will work for the maximum sampling rate. This mode is available for the DC222, DC252, and DC282 only. Please contact us if you have any doubts.



3.3.5. Timing

A crystal-controlled timebase is used to clock the ADC system of the digitizers. The timebase accuracy is guaranteed to be better than 2 ppm . The digitizers also include a built-in Trigger Time Interpolator (TTI) that measures the time from the trigger point to the first sample point. This information is essential for determining the precise relation between the trigger or other event of interest and the digitized samples of the signal. The TTI resolution is ~13 ps.

3.3.6. Timebase Range

The timebase range defines the time period over which data is being acquired. For example, the DC282 has a standard acquisition memory of 256 Kpoints and maximum sampling rate of 2 GS/s. Therefore, at the maximum sampling rate, the digitizer can record a signal over a timebase range of up to 130 µs (approx. 260,000 points * 0.5 ns/point). The timebase range can be adjusted by varying the amount of acquisition memory or the sampling rate of the digitizer.

3.3.7. Combining channels

The DC152, DC252, and DC282 digitizers offer the possibility of combining the converters (and their memories) from two or four channels to analyze a single input channel. With this feature the maximum sampling rate and the maximum amount of acquisition memory can be doubled or quadrupled if all of the input channels are not of immediate interest.

3.3.8. Data Readout

The DC222, DC252, and DC282 digitizers are capable of handling 64-bit 66 MHz readout. Such operation requires a single board computer or a cPCI interface + PC supporting such functionality. All devices in the crate must be capable of 66 MHz readout. The crate may also have to be set so as to allow this mode; this means M66EN must be open and V(I/O) should be 3.3 V. Acqiris CC103, CC105, and CC108 crates have toggle switches to select such use. This cannot be done in larger crates such as the Acqiris CC121. The actual transfer speed obtainable will depend on many other system characteristics.

3.4. Trigger

Normally the trigger settings applied to the digitizer are used to determine the time at which the device will stop acquiring data. They are also capable of a 'Start on Trigger' mode of acquisition (see the Programmer's Guide for further details). The various trigger settings are outlined below.

3.4.1. Trigger Source

The trigger source can be a signal applied to either an Input Channel (internal triggering) or the External Trigger Input. A standardized trigger in signal can also be routed via the PXI Bus Star Trigger line. Because of their high bandwidth HF front ends do not allow internal triggering.

The digitizers provide a separate front panel input that can be used as an External Trigger Input. The External Input provides a fully functional trigger circuit with selectable coupling, level and slope as for the Internal Triggering source. The external trigger has a fixed 50 Ω termination impedance. It allows optional BW limiter selections of 20, 200, or 700 MHz. The external trigger circuit has diode protection against overload. In all 50 Ω cases a ±5 V limit on trigger signals should be respected, although somewhat higher voltages for short time periods will not damage the unit.

3.4.2. Trigger Coupling

Trigger coupling is used to select the coupling mode applied to the input of the trigger circuitry. Modes available include AC LF Reject and DC. The AC LF Reject mode couples signals capacitively and removes the input signal's DC component and signals below 50 Hz. DC mode allows all signal components to be passed through to the trigger circuit. The HF Reject mode removes signal components above 50 KHz.

3.4.3. Trigger Level

The trigger level specifies the voltage at which the selected trigger source will produce a valid trigger. The trigger level is defined as a set voltage. Using the internal trigger, the level is set with respect to the midpoint voltage (V_m= – Offset voltage) of the digitizer's vertical scale. Internal trigger level settings (expressed in %) must be within V_m ± 0.5 FS, where FS is the channel Full Scale. All trigger circuits have sensitivity levels that must be exceeded in order for reliable triggering to occur.

The digitizers allow the user to choose the external trigger Full Scale from the set of values 0.5, 1.0, 2.0 or 5.0 V. The external trigger level can then be set to values in the range ± 0.5 FS.

The digitizers will trigger on signals with a peak-peak amplitude > 15% FS from DC to their bandwidth limit.

3.4.4. Edge Trigger Slope

The trigger slope defines which one of the two possible transitions will be used to initiate the trigger when it passes through the specified trigger level. Positive slope indicates that the signal is transitioning from a lower voltage to a higher voltage. Negative slope indicates the signal is transitioning from a higher voltage to a lower voltage.

3.4.5. Window Trigger

The digitizers implement a Window trigger. Two trigger level thresholds are used to define the desired range. The trigger can then be chosen to occur either when the signal exits or enters the window range. This mode can be thought of as the appropriate OR of two edge triggers of opposite slope.

3.4.6. HF Trigger

The digitizers implement an HF trigger that allows triggers to be reliably accepted at rates above ~ 1 GHz. In this mode, triggers occur on every fourth positive edge. The window trigger mode is not available.

3.4.7. Spike Stretcher

The trigger circuit also has a Spike Stretcher mode which ensures that even very short pulses are capable of generating triggers. This mode is useful if the time interval during which the trigger signal satisfies the threshold condition is less than 0.5 ns and the trigger frequency is less than 10 MHz. The trigger slope is positive in this mode.

3.4.8. Multi-source Trigger

The 10-bit digitizer family permits triggers that require a pattern condition including combinations of the trigger channels and the external trigger. The trigger condition defined above, on each of the inputs, defines the TRUE/FALSE state of each input. These states can be logically combined with AND, OR, NAND, or NOR to define the overall trigger condition. Potential triggers can then occur on the FALSE to TRUE transitions of the combined signal.

There is a small (~ns) delay between the times at which two simultaneous inputs arrive at the logical element that defines the overall trigger condition. If necessary, this must be corrected for by cable delay on the external input; the delay will depend on the overall configuration and therefore must be determined by the user.

3.4.9. Pre- and Post-Trigger Delay

To increase trigger flexibility a pre- or post-trigger delay can be applied to the trigger position.

The amount of pre-trigger delay can be adjusted between 0 and 100% of the acquisition time window (i.e. sampling interval x number of samples), whereas the post-trigger delay can be adjusted within the time interval corresponding to [0, $2^{35} - 1$ samples].

Pre- or post-trigger delays are just different aspects of the same trigger positioning parameter:

- The condition of 100% pre-trigger indicates that all data points are acquired prior to the trigger, i.e. the trigger point is at the **end** of the acquired waveform.
- The condition of 0% pre-trigger (which is identical to a post-trigger of 0) indicates that all data points are acquired immediately after the trigger, i.e. the trigger point is at the **beginning** of the acquired waveform.
- The condition of a non-zero post-trigger delay indicates that the data points are acquired after the trigger occurs, at a time that corresponds to the post-trigger delay, i.e. the trigger point is **before** the acquired waveform.

The digitizer hardware accepts pre- and post-trigger adjustments in increments of 16 samples. By definition post-trigger settings are a positive number and pre-trigger settings are a negative number.

Thus it is only natural that the software drivers treat pre- and post-trigger delays as a single parameter in seconds that can vary between *–nbrSamples * samplingInterval* (100% pre-trigger) and *+maxPostTrigSamples * samplingInterval* (max post-trigger). Since the Acqiris software drivers provide very accurate trigger position information upon waveform readout, the accepted resolution of the user-requested pre-/post-trigger delay is much better than 16 samples. For more details, refer to the Programmer's Guide.

3.4.10. Trigger Status

The front panel includes a tri-color LED indicator to show the status of the trigger. When the LED is green it indicates the trigger is armed and waiting for a valid trigger to occur. Red indicates that the trigger has occurred, the acquisition is complete and the data is waiting to be readout. The user can override the default functions and program the LED color in an application-specific manner.

3.5. External Clock and Reference

For applications where the user wants to replace the internal clock of the digitizer and drive the ADC with an external source, either an External Clock or an External Reference signal can be used. The Clock or Reference signals can be entered into the digitizer by the dedicated MMCX. In addition, the PXI Bus 10 MHz system clock signal (PXI_CLK10) can be used as the reference.

The External Clock must be continuously present for use by these digitizers. The input signal must have a frequency between 200 MHz and 2 GHz and a minimum amplitude of at least 0.5 V peak to peak into 50 Ω at the front of the digitizer. The transitions of the clock are defined with the aid of a threshold that is user selectable in the range [-3.0 V, 3.0 V]. The signals should not exceed ±5 V amplitude. For a detailed discussion on the programmed use of the external clock, refer to the Programmer's Guide.

For applications that require greater timing precision and long-term stability than is obtainable from the internal clock, a 10 MHz Reference signal can be used. The External Reference is nominally at 10 MHz. However, frequencies in the range [9.97 MHz, 10.03 MHz] will be accepted. If you do this you may need to correct for the difference in your application since the digitizer and the driver have no way to know about such deviations. The amplitude and threshold conditions, for an External Reference, are the same as for the External Clock. If synchronization between several digitizers is required, the reference signal should be applied to all of them.

3.6. Internal Calibration

The software drivers supplied include calibration functions for the timing, gain and offset settings, which can be executed upon user request. The digitizers are never calibrated in an "automatic" way, i.e. as a side effect of another operation. This ensures programmers have full control of all calibrations performed through software in order to maintain proper event synchronization within automated test applications.

The digitizers include a high precision voltage source and a 16-bit DAC, used to determine the input voltage and offset calibration.

For accurate time and voltage measurements it is recommended to perform a calibration once the module has attained a stable operating temperature (usually reached within 15 minutes of digitizer operation after power on). Further calibration should not be necessary unless temperature variations occur.

A full internal calibration of a digitizer can be very time consuming (> 100 s/digitizer), in particular for the HZ models. Therefore, several other options are available. They are documented in the **Programmer's Reference Manual**. A program can always be started with the digitizer in an uncalibrated state and data taken can be used for many kinds of testing. However, as soon as good data respecting the specifications of the instrument is required a calibration of at least the current acquisition state is needed. The full internal calibration has the advantage that it generates the calibration constants needed for any possible configuration of the instrument; its disadvantage is the time taken. If a more selective calibration is done it will allow the generation of good data in the current acquisition state. This calibration will remain useable whenever that acquisition state is used again for as long as the temperature of the instrument does not change significantly. A fast calibration of a channel in a configuration can be done in around a second. Many applications can save time by only performing calibration for the configurations that will actually be used. Calibration can usually be performed with signals present at the channel, external, and clock inputs. However, if the calibration is found to be unreliable, as shown by a calibration failure status, it may be necessary to remove such signals.

An application program will close devices if it exits normally. When a 10-bit digitizer is closed in this way its power consumption will be reduced. This has the consequence that if another application program is started later an appropriate warm-up period may have to be respected before a calibration is called for and full performance expected.

3.7. AS bus 2

The digitizers may be used in applications that require many data acquisition channels. In such cases it is possible to use more than one digitizer in a standard CompactPCI/PXI crate. Each DC Series 10-bit digitizer includes AS bus 2, a proprietary high bandwidth auto-synchronous bus system that allows multiple digitizers to work together synchronously.

AS bus 2 distributes both the clock and trigger signals along a plug-in front panel bus, between all the digitizers that participate in the system. It allows any digitizer to act as the trigger source and any other digitizer to act as the clock source (acquisition master), enabling all the digitizers to be clocked at the same time. Synchronizing the clock signals between the devices improves the accuracy of cross-channel measurements and is essential for accurate time correlation between signals on different channels.

AS bus 2 is intended to connect modules of the ***same type***, i.e. of the same model number, although some exceptions to this rule might be possible. If modules with the same model number, but different memory length options, are connected only the shortest memory length can be used.

The AS bus 2 connector is located on the front panel of each module. Bridges are used to connect adjacent modules for synchronization. An AS bus 2 multi-instrument is activated through software by a function call. Up to 5 6U modules, or 3 3U modules, may be synchronized with the AS bus 2. More detailed information and the commands required to set up the AS bus 2 clock and trigger distribution are included in the Programmer's Guide and Reference manuals.

3.8. Special Front Panel Inputs and Controls

Connector	Function
MMCX CLK IN	50 Ω External Reference or External Clock Input
MMCX I/O A	User configurable (see below)
MMCX TR OUT	Signal occurs after an accepted TRIGGER.
MMCX I/O B	User configurable (see below)

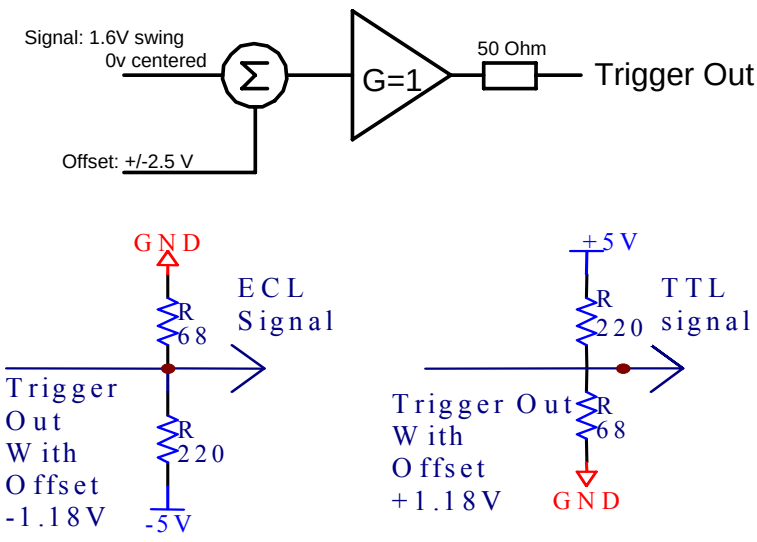
The I/O A and I/O B signals are 3.3 V compatible CMOS. This means that, on input, low is < 0.7 V and high must be in the range [1.7 V, 5.0 V]. An unconnected signal will be high. This definition ensures TTL compatibility. On output, the low level will be in the range [0 V, 0.7 V] and the high level in the range [1.7 V, 3.3 V] for HiZ. The high level output will typically give 0.8 V into 50 Ω. The I/O A or B connectors can be used for an *Enable trigger input* or the following output signals: *10 MHz reference clock, Acquisition skipping to next segment, Acquisition is active, Trigger is armed*.

3.9. External Trigger Output

When the digitizer is ready to be triggered and a valid trigger signal occurs, a trigger output is generated for external use. It is always available on the Front Panel Trigger Out MMCX connector. The pulse ends when the data acquisition for the trigger in question is complete.

⚠ ***NOTE:*** *The External Trigger Output functionality is implemented in the hardware. No Trigger Out signal occurs for software-generated triggers such as those of the AUTO mode of AcqirisLive or through the use of the function* ***AcqrsD1_forceTrigger.*** However, ***AcqrsD1_forceTriggerEx*** does generate the signal.

Trigger Output Block diagram:



The output swing is 1.6 V (± 0.8 V) when unloaded and 0.8 V when terminated on 50 Ω. The rise and fall times are 2.5 ns typical. The offset can be adjusted, by software control in the range [–2.3 V, +2.3 V] unloaded, or [-1.15 V, +1.15 V] into 50 Ω. The maximum output current capability is ± 15 mA. As the output is retro-terminated, it is possible to drive a 50 Ω line unterminated (HiZ) without loss of performance.

For a TTL compatible signal, set the offset to 1.0 V and the swing at destination will be +0.2 to +1.8 V.

For an ECL compatible signal, terminated on 50 Ω to –1.2 V, set the offset to –1.2 V and the output will be in the range [–0.8 V, –1.6 V]).

Alternatively, to reduce the current drawn from the digitizer, the terminations shown here can be used:

A standardized trigger out signal can also be routed to the PXI Bus Star Trigger line.

3.10. Electrical, Environmental and Physical Specifications

3.10.1. Electrical

	PCI Rev.	Max. Power Consumption (W)	Current Requirements (A)			
Model			**+12 V**	**+5 V**	**+3.3 V**	**-12 V**
DC122 Default Memory	2.2	31.9	0.11	3.5	3.5	0.01
DC122 Optional Memory	2.2	41	0.11	3.5	6.3	0.01
DC152 Default Memory	2.2	32.9	0.11	3.7	3.5	0.01
DC152 Optional Memory	2.2	42.1	0.11	3.7	6.1	0.01
DC2x2 Default Memory	2.2	61.6	0.1	6.7	7.2	0.03
DC2x2 Optional Memory	2.2	80	0.1	6.7	12.5	0.03

The Maximum Power Consumption has been increased by 5% over the value calculated with the currents shown to take into account higher allowed values of the crate voltages. The current requirements of the DC222 and DC252 models are only slightly lower than the DC282 case. The differences between the different front end options are also small; a single Standard or HZ channel pulls ~0.3 A @ +5 V.

The electrical requirements shown above can impose loading limitations in the cPCI crate. In the extreme case where a PC503 processor is present in an Acqiris crate the following limits apply:

Crate	**DC1x2 all models**	**DC2x2 Default Memory**	**DC2x2 Optional Memory**
CC103	None	None	None
CC105	None	None	3
CC108 normal and low power	None	4	3
CC108-600	None	6	3
CC121	None	14	8

If a third party crate is being used please check that the current drawn at 3.3 V does not sag below the effective PCI allowed tolerance at the beginning of the acquisition. Acqiris 3-, 5-, and 8-slot crates should be modified at the factory for use with these modules.

The digitizers can use the PCI Bus at 32-bit − 33 MHz, all models, or at 64-bit − 66 MHz, DC2x2 only . The latter allows data to be transferred with DMA at average rates up to 350 MB/s with appropriate hardware under Windows and Linux. Otherwise, the DMA transfer rates are limited to ~100 MB/s. The CompactPCI modules are compatible for either V I/O = 3.3 V or 5V.

3.10.2. Environmental and Physical

The modules have a Declaration of Conformity according to ISO/IEC Guide 22 and EN45014 and **CE** Marks of Compliance.

The front panels of the CompactPCI modules are in compliance with the IEEE 1101.10 standard.

Operating Temperature

0° to 40°C

The above values are for the ambient temperature of the room (or equivalent) where the CompactPCI crate is located. The temperature as measured on the board may well be significantly higher. On-board temperatures above 60°C should be avoided.

Relative Humidity

5 to 95% (non-condensing)

Dimensions

The DC122 and DC152 conform to the 3U CompactPCI standard (100 mm × 160 mm × 20 mm). All other DC modules conform to the 6U CompactPCI standard (233 mm × 160 mm × 20 mm).

Safety

Complies with EN61010-1

EMC Immunity

Complies with EN61326-1: Industrial Environment

EMC Emissions

Complies with EN61326-1: Class A for radiated emissions

Required Airflow

> 2 m/s in situ

4. Running the AcqirisLive Application

AcqirisLive is an application to control and demonstrate the capabilities of Acqiris digitizers on a single machine. **AcqirisMAQS** is a more advanced application offering many interesting possibilities for the control of acquisition systems in a single or multi-machine environment. Ask your sales representative or Agilent Acqiris Support for more information.

4.1. Getting Started with AcqirisLive

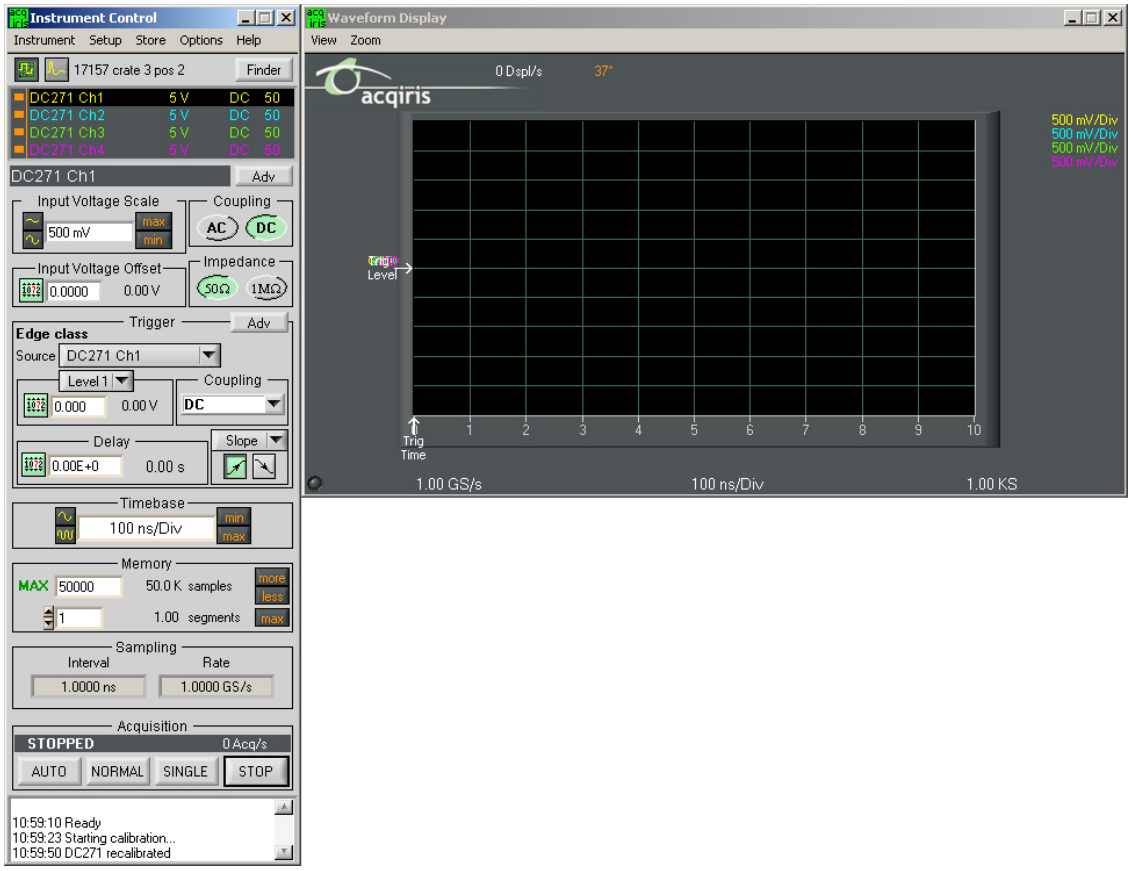
Once the software and hardware installation described in Section 2 of this manual is complete, you will find AcqirisLive in the start menu of your computer. Start AcqirisLive from the menu. An initial AcqirisLive load screen will appear followed by a panel of controls and a waveform display window.

During startup, AcqirisLive searches for all Acqiris digitizers on the PCI bus. If no digitizers are found on the PCI bus, AcqirisLive will display an error message indicating that no digitizers were found, and the program will continue in simulation mode. If this is not wanted, turn off the computer, install and turn ON the hardware on the PCI bus and, then, restart the computer.

AcqirisLive is intended to verify the functionality of the card and to serve as an easy to use and convenient program for capturing, displaying, and archiving captured data into the format of your choice, binary or ASCII. AcqirisLive is provided free with the purchase of any Acqiris digitizer.

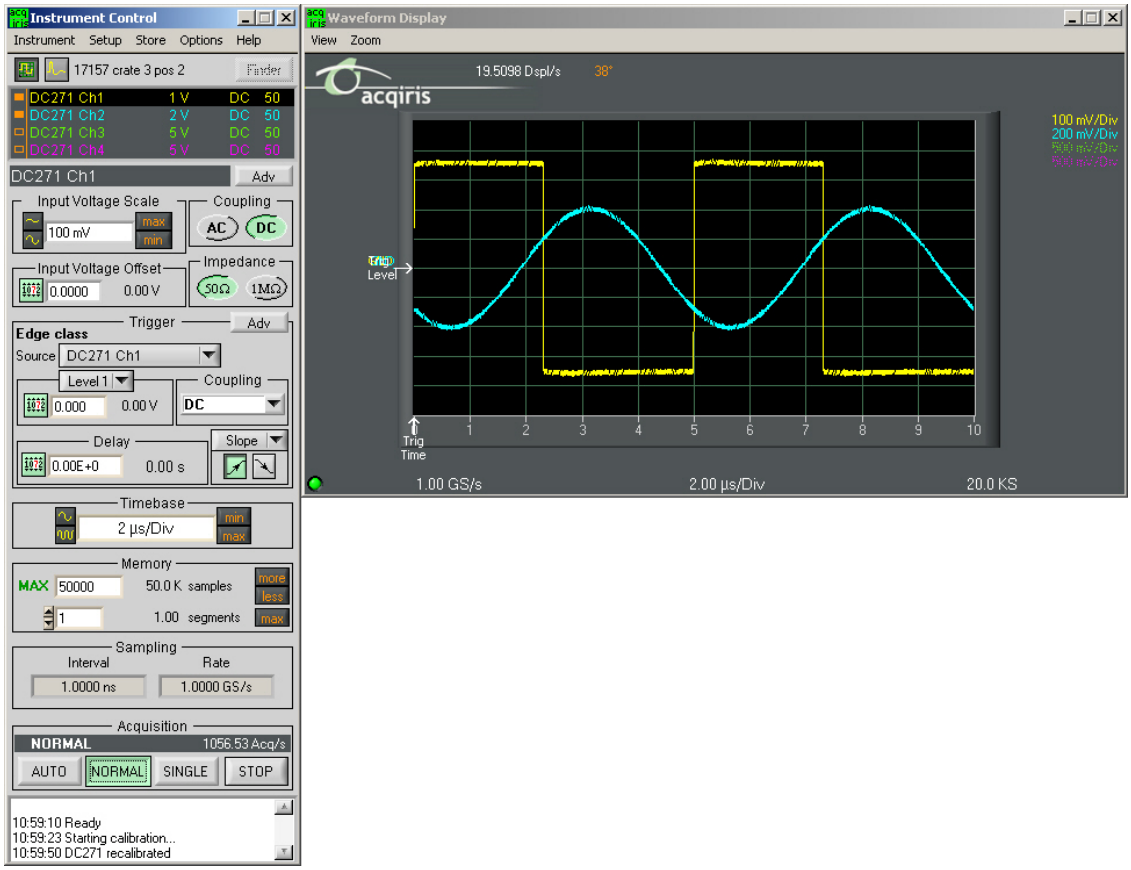
We supply drivers on the CDROM for National Instruments LabWindows/CVI, LabVIEW, Microsoft Visual C++, and Visual Basic. We also provide some examples (GetStarted applications) as a guide or starting point for programmers developing their own applications to interface with the DC series digitizer cards.

When you start AcqirisLive a display like that shown below appears.

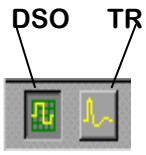


AcqirisLive displays two independent windows, a control window and a display window. The control window contains functions that allow you to manipulate the acquisition parameters of the card. In order to display an acquired waveform, connect a signal to the input, and then select the Auto acquisition mode at the bottom of the control panel. A waveform should appear in the display.

Other controls in the control panel allow you to select the optimal acquisition settings for your particular signal. Each of the other control panel functions will be discussed in detail in the following Control Panel Functions section. Here is a sample result.



4.2. Control Panel and Functions



4.2.1. Control Panel Mode

In AcqirisLive there are two control panel modes available, Oscilloscope Mode and Transient Recorder Mode. The choice of mode is entirely determined by the preference of the user.

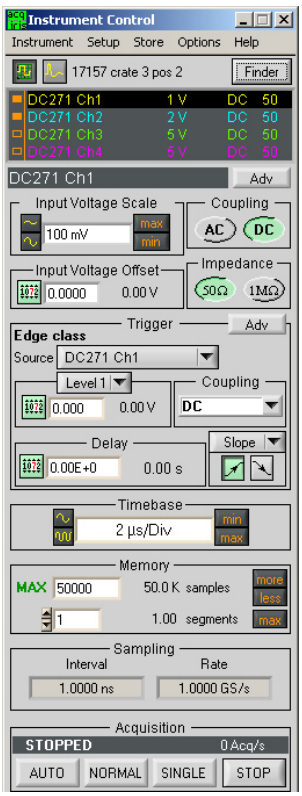
Both modes provide the same set of functional capabilities but display the settings slightly differently. For example in Transient Recorder Mode, the user selects the Full Scale Range of the amplifier whereas in Oscilloscope Mode the user selects the input voltage scale set in Volts/Div. The desired mode is selected using one of the two buttons shown at the top of the control panel. The distinction between the control panels for the two operating modes can be seen in the images below.

In both modes it is possible to set the memory depth and the sample speed independently within the limits of the maximum available memory. However the two modes differ in the following way.

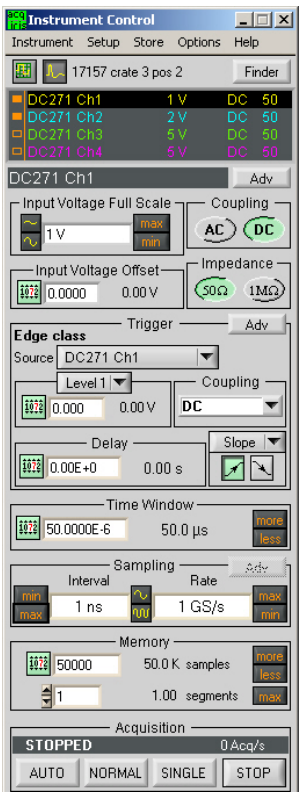
In Oscilloscope Mode, the user selects the time window (time per div) and the sampling rate will be adjusted to the fastest possible within the limits of the available memory. The maximum available memory is programmable.

In Transient Recorder Mode, the user selects the capture time window, the sampling rate, or the number of samples. When selecting the capture time window, the number of samples is adapted, keeping the current sampling rate and number of segments, up to the maximum available memory on the card. When selecting the sampling rate, the number of samples is adapted, keeping the current capture time window and number of segments, up to the maximum available memory on the card. When selecting the number of samples, the capture time window is adapted, keeping the current sampling rate and number of segments.

Oscilloscope Mode



Transient Recorder Mode

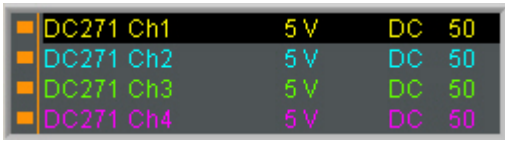


4.2.2. Displaying Multiple Traces

If multi-channel modules, or several single channel modules, are installed on the PCI bus, multiple waveform displays, one from each installed channel, are overlaid on the display.

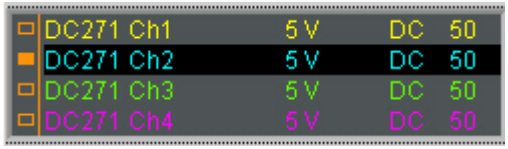
The **current channel** is selected by clicking on the channel name within the upper portion of the control panel. The vertical settings of the current channel and the timebase and trigger of the correspondent digitizer are then indicated. A unique name is given to each channel installed on the PCI bus. The current channel is indicated by a dark highlight over the name. Settings changed on the main control panel will only affect the active channel. Always verify proper acquisition setting for each channel prior to collecting data.

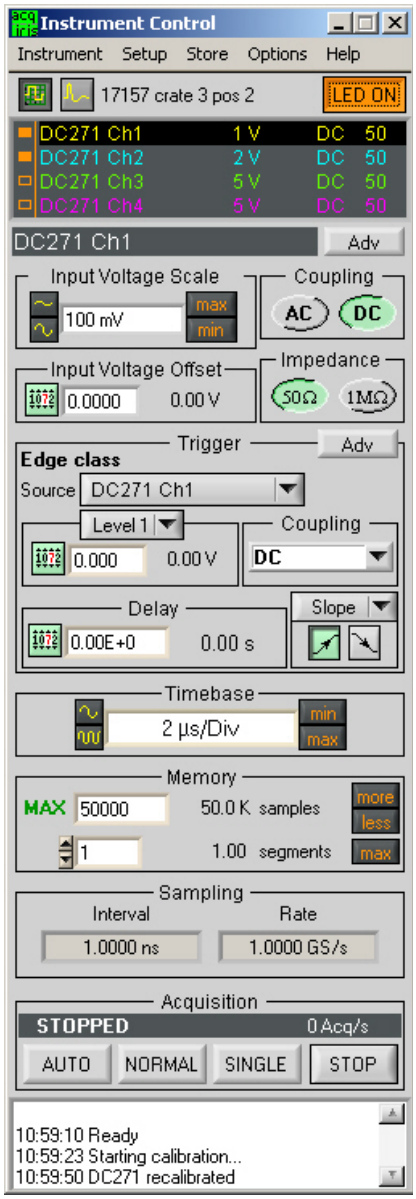
There is a small rectangular indicator button to the left of each channel name in the channel list. If this indicator is filled in, the channel waveform is active; the channel is turned on and displayed in the display window. Clicking on this indicator once turns it transparent. This deactivates the reading of the data from the channel and clears the waveform display. Clicking once again on the indicator turns the channel back on and the indicator is filled in. After making such changes the channel data will not be displayed until after the next acquisition.



The image at the left shows a channel list with four active channels in the system. All are turned on and displayed in the display window as indicated by the black indicators at the left. The DC271 Ch1 is the currently selected channel.

The channel list image at the right shows the same system with the DC271 Ch2 selected as the current channel. The other indicators are transparent and therefore their channels are turned off and not displayed.





As an alternative to controlling the channels to be displayed from the control panel you can also control them by selecting the desired channels from the list of channel gains shown at the right hand side of the display window.

Pressing the Finder button at the top of the control panel will identify the module associated with the current channel. When the finder button is depressed, the LED on the front panel lights up yellow on the digitizer module with the current channel.

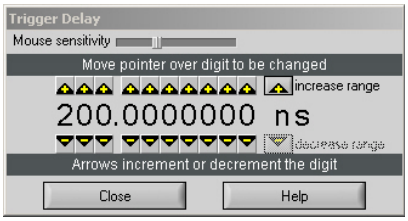
4.2.3. Numeric Editor

The numeric editor is shown in the control window at locations where numeric values are set. The Acqiris Numeric Editor enables easy input of numeric values, particularly those ranging over many decades. The numeric value can be changed in multiple ways.

A number can be typed directly into the white number display area or alternatively, the Acqiris Numeric Editor may be used. In order to use the Acqiris Numeric Editor, click on the green numeric editor icon at the left of the number display. A numeric editor control will appear as shown.

The methods to change the values are:

1. Increment or decrement any digit with the arrow buttons by pressing the increment or decrement button. When the button is held down, the digit will continue to increment or decrement automatically.
2. Click on a digit and drag the mouse up or down to increase or decrease the value.
3. Type a new value with the keyboard for any highlighted digit.



The value is constrained to fall within its allowed range whenever the user attempts to enter a larger or smaller value. Digits that are below the resolution or granularity cannot be modified. A message is displayed in the numeric setting control window when the pointer is positioned over a digit that is below the allowed granularity and cannot be changed.

4.2.4. Keyboard shortcuts

Two shortcuts have been defined to simplify applying changes of a parameter to a group of channels. When the mouse is over the control of a channel parameter -

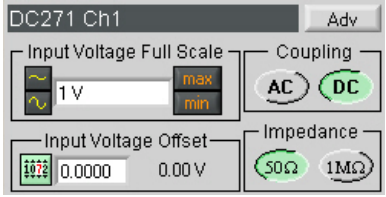
- 's' can be used to set the current value to all channels of all available instruments
- 'c' can be used to set the current value to all channels of the current instrument.

Other shortcuts are:

- 'Ctrl-S' as a synonym for 'Save Setup'
- 'Ctrl-R' as a synonym for 'Recall Setup'
- 'Ctrl-C' as a synonym for Calibrate all (active) instruments'
- 'Ctrl-E' functions as a toggle between 'Internal Clock' and 'External Clock' operation.

4.2.5. Input Voltage Scale, Offset and Coupling

Settings for input voltage scale, offset, coupling and impedance are available in the portion of the control panel shown to the right. The selected channel is shown on the upper section of the display. Only this channel will be affected by changes in any settings on the control panel. The input voltage scale is set by one of three possible methods:



1. Clicking on the white numeric display of the voltage scale will show a pop-up list. Select the desired gain setting with the mouse pointer.
2. Clicking on the Decrement / Increment icons will step the voltage scale up or down to the next level for each click of the mouse.
3. Clicking Max / Min will toggle to the least sensitive gain setting or to the most sensitive gain setting.

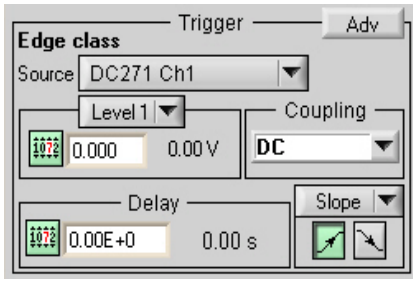
The input *Coupling* can be set for AC or DC. The selected setting is shown as an actuated indicator with a green backlight. AC coupling blocks DC signal components from the input. The AC coupling mode acts as a high pass filter passing frequencies above 10 Hz. In DC coupling all frequency components are passed through the input.

The *input voltage offset* control applies an offset to the input amplifier in order to better digitize and display signals offset away from 0 volts. Signals riding on a DC level can be most accurately characterized when the offset is adjusted so that the acquisitions are made about the midpoint of the digitizer's Full Scale Range, and when as much of the 8-bit ADC range is used as possible. The ability to select an offset voltage enables accurate measurement when offsets are present in the signal.

The *Impedance* selection allows the user to choose the appropriate internal input termination of 50 Ω or 1 MΩ.

The *Adv* button in this section gives access to the choice of hardware bandwidth limits for the channel.

4.2.6. Trigger



Trigger characteristics are set using the settings in the control panel *Trigger* section. The trigger *source* setting can be either Internal (trigger on any one of the input channels) or External (trigger on an external input). The trigger source is indicated in the display by the name appearing under *Source*.

In order to select the trigger source, click the drop-down source menu in the trigger *Source* section of the control panel and choose the desired one.

Notice that, for most digitizer models, when external trigger is selected, the controls for the trigger termination, 50 Ω or 1 MΩ, are enabled in the *Coupling* section. Select the desired termination for the external trigger.

The *Coupling* section also contains a selection for AC or DC coupling. AC coupling on the trigger sets the trigger circuit to an AC Low Frequency Reject mode.

Use the *Level* section to set the desired trigger level. The relationship between coupling, trigger source, and trigger level was discussed in section 3.4.3 **Trigger Level**. The 10-bit digitizers have two adjustable trigger levels associated with the range of the window trigger.

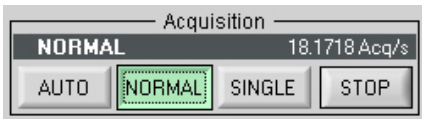
The trigger *Delay* setting positions the acquisition with respect to the trigger. Pre-trigger values are negative and are selectable in the range of [0 to – (10 * timebase)]. The value (10 * timebase) is equivalent to the time window or capture-time. 100% pre-trigger is achieved by setting the Delay to -capture-time. A 100% pre-trigger delay means the trigger point is at the right edge of the display and all of the data in the acquired waveform were captured just prior to the trigger event.

Maximum Post trigger delay settings depend on the sample interval used. Post trigger delays are adjustable up to 100 Mpoints.

When a *Slope* box is shown next to the delay section, selecting the trigger slope is achieved by depressing either the positive or negative slope buttons. The 10-bit digitizers extend the functionality of the *slope* section to allow the choice of the window, HF divide, and Spike Stretcher trigger modes when the multiple mode slope button is selected. When the Window trigger is chosen buttons below it will allow the user to choose between trigger on entering or exiting the window trigger level range.

The *Adv* button in this section gives access to the choice of External Trigger range and Bandwidth Limiter. It also allows the user to set the offset of the trigger out signal.

4.2.7. Acquisition Mode



The acquisition mode of the digitizers is selected using one of four acquisition mode buttons in the Acquisition section of the control panel. Available acquisition modes are Auto, Normal, Single and Stop.

This Acquisition section of the control panel also indicates the number of waveforms acquired per second by the digitizer. The use of each of the acquisition modes is described below. In the discussion, a valid trigger indicates a trigger signal meeting the trigger conditions at a time when the digitizer is

armed and ready to acquire data. In Single and Normal modes the display will only be updated after each active digitizer has received a trigger.

Stop will stop the acquisition and hold the latest complete acquisition on the display.

Single mode is used in order to capture one event at the first valid trigger. It freezes the acquisition in the digitizer's memory, and on the display, until the user requests another acquisition. After an acquisition is taken in Single mode, the digitizer will ignore subsequent trigger events until the Single button is pressed again or another acquisition mode is selected. Pressing the single button re-arms the trigger and captures one acquisition at the next valid trigger.

Normal mode is used to continuously acquire waveforms into memory for valid trigger events. The display is updated with the new acquisitions in accordance with the Display Refresh Rate setting under the Options menu on the top line of the AcqirisLive Control window. Acquisitions will happen for each valid trigger until either single or Stop is pressed.

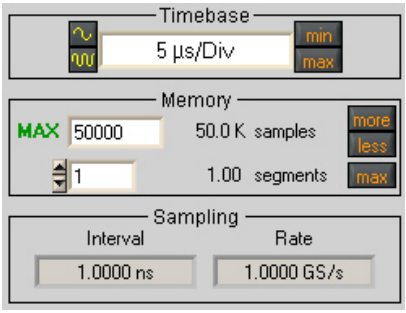
If the trigger indicator at the lower left of the waveform display does not blink green, the digitizer is not receiving valid triggers. Check the trigger settings or select Auto mode in order to obtain a display of the waveform.

Auto mode will acquire and display waveforms according to the trigger settings if a valid trigger is present within a timeout interval. If a valid trigger is not available within this interval, the digitizer generates its own trigger in order to digitize and display whatever signal is at the input at that time.

If valid triggers are received at a high enough rate, Auto mode behavior differs little from normal mode behavior on the display. However if the trigger rate is too low or trigger settings are not appropriate for the characteristics of the signal, the input signal will not be stable on the display. This occurs because the internal auto-trigger generated by the digitizer is asynchronous to the input signal.

Auto mode is often used to aid in setup when the input signal must be quickly characterized in order to determine proper trigger settings for Normal or Single mode acquisitions.

4.2.8. Timebase and Memory



The timebase and memory settings should be chosen together in order to optimize the desired sample rate for the acquisition.

In Oscilloscope Mode the timebase settings range from 10 ns/div to 5 S/div. In Transient Recorder Mode time windows of 100 ns to 20 Ks are available when using a card with the 2 Mpoint memory option.

In order to change the timebase click on the white area in the timebase display window and select the desired timebase from the list. Alternatively, the Decrement / Increment timebase selection buttons may be used in order to change the timebase in steps with each click of the mouse. The sample rate and sample interval resulting from the combination of memory and timebase are indicated under the *Sampling* section of the control panel.

The Memory setting shows the maximum number of points to be acquired. The actual number of points acquired could be less than the maximum number set if the acquisition time window selected fills less than the selected amount of memory at the full sample rate. Alternatively, in Oscilloscope Mode, if a slower timebase is selected, in order to ensure that the selected amount of memory will be filled before the acquisition is complete, the digitizer will reduce its sample rate as necessary. This action differs from the same case in Transient Recorder Mode where preference is given to the selected sample interval.

In Transient Recorder Mode, the digitizer will continue to allocate more memory with increasing capture times. This is done in order to maintain the selected sample interval for as long a time window as is possible given the available memory. When the card memory is fully utilized, the sample rate will decrease with increasing capture times.

4.2.9. Using digitizers of different models simultaneously

AcqirisLive features a single *timebase* (i.e. the set of acquisition parameters pertaining to the time axis of the waveform, such as the sampling rate and the number of samples). It is therefore not possible to specify different timebase settings for different digitizers. However, it is possible to run each digitizer at its maximum available sampling rate performance in the following way:

- Select the Oscilloscope Mode.
- In the channels list, select a channel from the fastest digitizer (that will make that digitizer the *current digitizer*).
- Make sure the maximum number of samples (*MAX samples* in *Memory* panel) is large enough.

- Select the desired time per division setting (*timebase* panel): the fastest sampling rate for the current digitizer, compatible with the maximum number of samples, will be selected and applied to all digitizers in the system. Any digitizer not capable to satisfy that sampling rate will run at its closest setting.

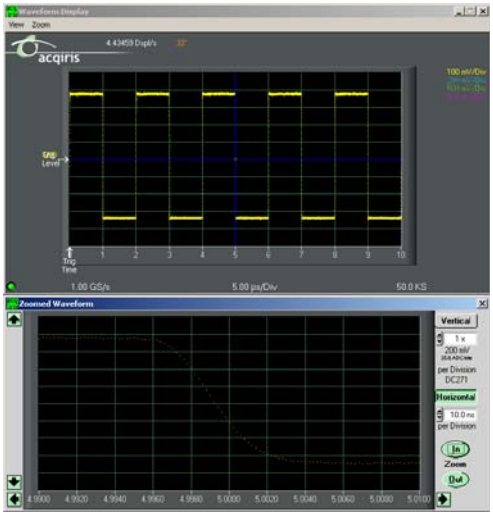
Finally, note that the sampling rate menu (visible in Transient Recorder Mode) contains the sampling rate capability of all digitizers currently in use. You must turn off the channels of 'slower' digitizers in order to view the highest sampling rates of the 'faster' digitizers.

4.2.10. Segmented Memory

Segmented memory enables the sequential acquisition mode. This feature is particularly useful when capturing impulse-response type waveforms in a variety of applications. Segmented memory is available in all acquisition modes. However, it is generally used in either Normal or Single mode. Waveform display occurs only after all segments are filled. Segments can be displayed sequentially on the display or they can be overlaid on top of each other. To select an overlaid display, select the item Overlay Segments under the Options menu. Segmented data can be archived to any storage device on the computer in a similar way to non-segmented acquisitions. If the acquisition needs to be stopped before all segments are filled, press the Stop button.

In order to set up the sequential acquisition mode, simply select more than 1 segment on the segment selection control under the *Memory* section of the control window and start the acquisition.

4.2.11. Display Features, Zoom and Persistence



A waveform zoom feature is available under the View menu of the display window. The screen image below shows the normal display and the zoom window that appears when zoom is selected.

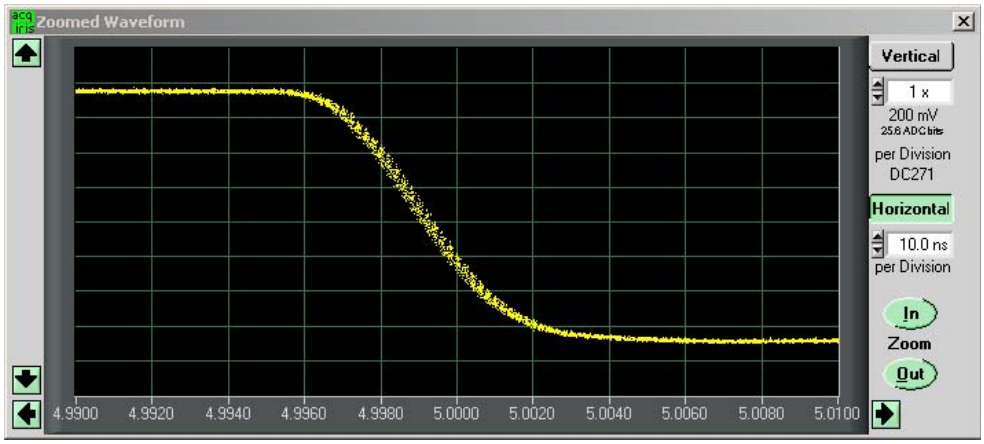
The zoom scale and center position are modified using the horizontal and vertical controls shown on the zoom display window. To the right side of the zoom window click on the “Horizontal” button, then modify the zoom expansion factor by clicking the “In” or “Out” buttons.

The vertical blue cursor, or box, (depending on the zoom factor), shown on the main display window indicates the center point and range of the zoom. The vertical box or line can be dragged right or left with the mouse in order to re-position the center point of the waveform displayed in the zoom display window. Alternatively, the right and left arrows at the bottom of the zoom display window will reposition the horizontal center of the zoom.

In order to expand the zoom region vertically, select the “Vertical” button on the zoom display and click the “In” / “Out” buttons. Alternatively, the up / down arrows on the scale indicator just below the vertical button can be used. When the vertical scale is expanded, the top and bottom lines forming the blue box in the main display window show the extent of the vertical zoom region. The vertical position of the box, and thus the data region shown on the zoom display, may be changed by moving the box vertically with the mouse or by clicking on the up and down arrows at the left of the zoom display window.

When expanding a waveform to the point where individual data points are seen, it may be desirable to use the “Connect data points” option under the Options menu in AcqirisLive. When this option is selected, larger data points are drawn on the display and a line connects each point.

The main display window contains a drop down selector that controls the display type for both the main display and



the zoom window. There are two modes available, the Live Display, or the Persistence Display. When persistence display is selected, all points drawn to the display windows remain on while new points are added from subsequent acquisitions. This mode is particularly suited for examining the jitter on an edge of a periodic signal as shown in the image below.

To clear the display in persistence display mode, press the "Clear" button that appears on the main display window.

4.3. Top Line Menu of AcqirisLive

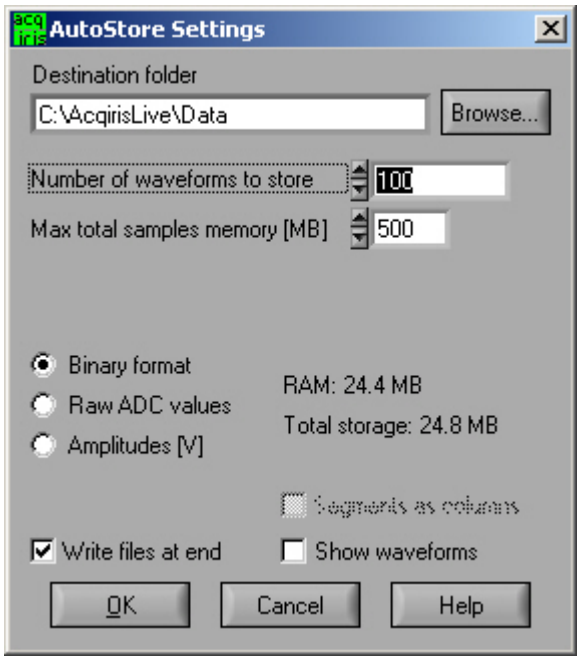
The top line menu contains functions offering additional utility to the AcqirisLive application. Provisions are included for storing instrument setups, waveforms, converting the format of stored data files, identifying models and versions and in the Options Menu, calibrating the digitizer, extended control of event acquisition and controlling the display properties. These possibilities are discussed in the next few sections.

4.4. Setup

The Setup menu allows you to store and recover instrument configurations. When you store a configuration the parameters used to configure each of the channels of each module together with the timebase and trigger configurations will be saved in a file. You will be asked to choose the destination directory for the file and be allowed to give it an appropriate name. When you choose to recover a file you will be asked to give the name or navigate to it using the browser functionality. If you are using many modules the settings in the configuration file will be associated preferentially with the digitizer that has that serial number or then with the digitizer in the same location.

Only the parameters of the modules are stored in the configuration file. This means that parameters of the AcqirisLive program, such as channel activation and display mode choices are not included.

4.5. Store, Autostore and Conversion of Waveforms



The store menu gives you two mechanisms to store waveforms.

1. The Store Waveform option allows you to store the last acquired waveform for the current channel. To store the last acquired waveform for each of the active channels, you must sequentially select each one to make it the current channel and use the Store Waveform menu command. The title of the Store Waveform dialog indicates the name of the channel that will be stored. The data is stored in ASCII format, as Raw ADC values or Amplitudes (in Volts).

2. The Autostore option allows you to store consecutively acquired waveforms from all of the active channels into files. Configuration of Autostore is achieved by selecting the Autostore item under the Store menu. Autostore brings up the dialog box shown here. Three formats are available for stored waveforms, Binary, Raw ADC values, and Amplitude values (in Volts). The destination folder can be selected or created on any system drive using the Browse button. Waveforms will be stored in a new folder under the destination folder. The new folder will be named **AcqirisRun_{date}_{time}**. Each waveform will be stored in a file with a name {channel identifier}_{i}.{suffix}, where i goes from 1 to N and the suffix indicates the data type. If the data is stored in Binary form, the suffix will be **.data** and an additional ASCII format **.awh** file is written which contains necessary details about each of the other files. Otherwise, the suffix will be **.awd**.

   The number of generations of waveforms to be stored with this function is selectable from 1 to N. N is a maximum number dependent on the number of samples taken in each waveform. There is also a user selectable limit on the total amount of data allowed in any single Autostore acquisition series.

   When using segmented memory with Autostore, a waveform is considered to be a complete set of acquired segments. When storing Amplitudes, it is possible to write each segment as a separate column of data in the waveform file. This is achieved by clicking the check box option *Segments as columns* in the Autostore settings window. Formatting with segments in columns, in Amplitude format, is limited to 200 segments.

The Binary file format selection provides the fastest storage performance and generates the smallest files on the hard drive. Binary files can be subsequently converted to either Raw ADC values or to Amplitude values using the Data Format Conversion utility provided with AcqirisLive.

Selecting the "Write files at end option" acquires all waveforms into memory first, before converting to the selected format and writing the data to disk. This option allows for faster data capture times. Selecting the "Show waveforms" allows the user to see the waveforms before writing them to disk.

When all parameters are selected, click OK, and then select Normal, Auto or Single acquisition mode. When the waveforms are recorded a progress bar will appear to show the status of the acquisition and of writing the data to disk. The Autostore function can be aborted from the progress bar.

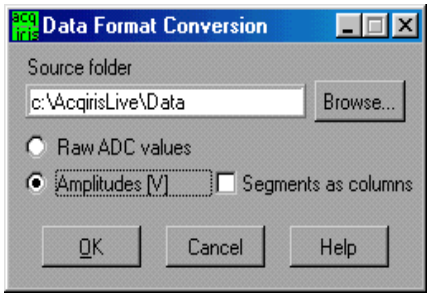
Raw ADC values are the raw 16-bit ADC levels in ASCII format. The channel's gain and offset are needed in order to obtain the signal level in Volts. The required information to convert the Raw ADC values to voltage is included in the header information of each Raw ADC ASCII file or in the **.awh** file accompanying the binary files. In order to convert the Raw ADC values into Volts the following formula should be used.

$$V = vGain * data - vOffset$$

The Amplitudes [V] selection stores the waveforms as voltage samples in ASCII format. This data has already been adjusted for gain and offset and can be directly read out as a voltage. However, it requires roughly twice as much space as Raw ADC value data.

For the sequential acquisition mode, the segment time stamps are also stored when waveforms are saved using the Autostore and Save Waveform functions.

Data stored in binary format with Autostore must be converted before it can be imported into a data processing package or a spreadsheet (e.g. Excel). The Data Format Conversion option is found under the Store menu. Select Data Format Conversion in order to bring up the following window. The acquisition must be stopped in order to access this menu.



To convert the binary data, simply select the source folder where the data is located, select the output format and click OK.

All binary data files found in the source directory will be converted to the desired format. If you are writing amplitudes with multiple segments, formatting with segments in columns is limited to 200 segments.

4.6. Calibrate

The Calibrate item in the Options menu leads to a sub-menu where a particular type of calibration can be invoked. In order to use this item the acquisition must be stopped; otherwise the Calibrate option is not selectable. The possibilities are

- Calibrate instruments - to perform a self-calibration on the digitizers, calibrating the gain, offset, trigger level and the timing. Performing a calibration compensates for any drift in these properties, typically due to component temperature variations.
- Calibrate current combine configuration – to perform a calibration only at the current configuration in each instrument.
- Calibrate External Clock Timing – to do a calibration of the internal TDC in the Continuous External Clock mode.

4.7. Combine channels

The Combine Channels function in the Options menu give the 10-bit digitizer user the control of how many converters will be used for each channel. This allows the memory size and the sampling rate to be increased in situations where not all of the input channels need to be acquired. Normally digitizer modules work with one converter/channel. If two or more converters/channel are desired, the identities of the channels to be used have to be chosen with the Active Channel control.

4.8. External 10 MHz Reference and External Clock

Either one of the External 10 MHz Reference or External Clock options can be selected in the Options Menu. The external input threshold option, available in the options menu, must also be set appropriately. The 10 MHz Reference can be activated at the I/O B output.

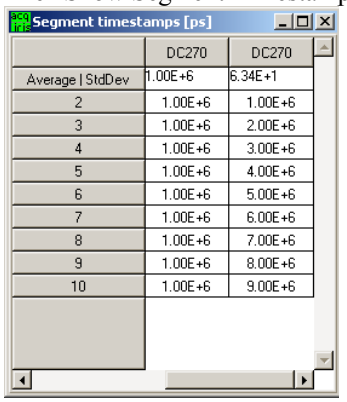
The External Clock function is available in AcqirisLive only when using the control panel in Transient Recorder Mode. The input frequency should be keyed into the clock frequency selector (outlined in red) on the control panel. Then the appropriate sampling frequency must be selected in order for the proper timebase to be displayed on the waveform display window. The time window displayed can be manipulated by allocating more or less memory to the acquisition.

The External 10 MHz Reference in AcqirisLive is designed to work either in Oscilloscope Mode or in Transient Recorder Mode. The timebase and sample rate for waveform capture is fully selectable when using the external reference, just as it is when using the digitizer's own internal reference clock.

4.9. Additional Waveform Information

The Options menu also includes possibilities to obtain additional information about the waveform. In both cases described below the display will be updated after each acquisition.

The "Show Segment Timestamps" option shows a display like the one below:



	DC270	DC270
Average | StdDev	1.00E+6	6.34E+1
2	1.00E+6	1.00E+6
3	1.00E+6	2.00E+6
4	1.00E+6	3.00E+6
5	1.00E+6	4.00E+6
6	1.00E+6	5.00E+6
7	1.00E+6	6.00E+6
8	1.00E+6	7.00E+6
9	1.00E+6	8.00E+6
10	1.00E+6	9.00E+6

It gives you the information needed to better understand the trigger times of the individual segments of an acquisition. By definition the first trigger of an acquisition occurs at $\mathbf{t_1=0.0}$. There are two columns for each digitizer. For the n'th row, the first column contains the difference $\mathbf{t_n - t_{n-1}}$ and the second column contains $\mathbf{t_n}$. The top line contains the average value of the $\mathbf{t_n}$ in the left column and the standard deviation of the $\mathbf{t_n}$ in the right one. The times are in ps.

The "Show Parameters" option activates a display of pulse parameters for each active channel. Inactive channels will have parameter values of 0.0. The parameters will be calculated in a model in which the distribution of measured voltages has two distinct peaks. If this condition is not satisfied the results will be unreliable.

4.10. Display Features

Display features in the Options menu include items for

- turning the waveform display off (by de-selecting "Display Waveforms"),
- overlaying segments of a sequence,
- connecting displayed data points,
- modifying the display refresh rate,
- displaying the internal temperature of the currently selected module

4.11. Command Line Switches

When starting the AcqirisLive application, the executable's name in the command line can be followed by one or more switches to change the running conditions.

Syntax

The syntax of the command line is the following:

***path*\AcqirisLive.exe** *options*

where *options* are chosen from the following list

[-a][-b][-B][-c][-d][-h][-i][-l][-m][-n][-p][-s][t][-v][-x]

Available Switches

List of available switches:

-a **start in Averager mode**

-b **Buffer size for large waveforms**

-B **Number of bank for SAR mode**

-c **no initial calibration**

-d **use DMA for data transfers (default)**

-h high priority process (default)

-i use acquisition interrupts

-l low priority process

-m medium priority process

-n no DMA for data transfers

-p Use acquisition polling

-r start in Transient Recorder (digitizer) mode

-s simulation mode

-t temperature update off

-v show acquisition state

-x disable automatic multi-instruments

Operation Mode

Acqiris averagers can be operated in *Averager Mode* or in standard *Digitizer Mode*.

AcqirisLive operates in either mode, but since these are mutually exclusive, only instruments that support the chosen mode are accessible in any given mode. E.g. only averagers are accessible in Averager Mode, while both digitizers and averagers are accessible in Digitizer Mode.

The operation mode can be switched within the application. By default, AcqirisLive starts in Digitizer Mode.

Buffer size

Upon startup of the application, the available physical memory on the computer is checked. The total data buffer size is then limited to the available memory minus 10% of the total memory. It is also possible to limit the total data buffer size to a fixed value with the **-bn** option (where n is the limit in MB, e.g. -b200 will limit the buffer to 200 MB). The data buffer is then shared among the active channels.

When the total acquisition memory (sum over all active channels) exceeds the data buffer size limit, readout of the data will be partial. The special operation modes such as Segments Average, Average, Digital Filter and FFT are not supported with partial data readout.

Partial readout is controlled with the Very Long Memory panel (menu Options ->Very Long Memory...). The first segment and the first sample to read out can be specified. Note that if the buffer is large enough for at least 1 full segment, only full segments will be read (i.e. first sample control is ignored).

When saving data to file, you will be prompted for a maximum number of segments per file.

Banks for SAR

The U1071A-FAMILY and some of the 10-bit Family modules are capable of acquiring data and being read out simultaneously. The **-Bn** option allows the internal memory of the digitizer to be divided into n banks. To observe the improved acquisition trigger rate achievable in this mode it is suggested to set up the desired conditions and then turn the event display off. The trigger out signal can be used to monitor the trigger rate; an interval width trigger can be used to check if triggers are missing.

Calibration

Before operation, the instruments must undergo an internal calibration. As this calibration can only proceed sequentially for each channel, the initialization time of AcqirisLive can become significant for systems with many channels. Therefore, it can sometimes be desirable to be able to start the application quickly by skipping the calibration (which must then be done "manually" before collecting correct data).

DMA Data Transfers

By default, data transfers on the PCI bus between the digitizer memory and the PC are done in DMA (Direct Memory Access) mode, which allows the fastest transfer speeds (up to about 130 MB/s peak, 100 MB/s sustained acquisition data rate). These very high data rates are not well supported by all hardware configurations (PC motherboard), and system hangs due to endless retries on the PCI bus have been observed on some machines. Such problems disappear when switching DMA mode off (data transfer rate is then about 2.8 MB/s).

Please note that switching DMA data transfer mode off precludes the use of acquisition interrupts. The –i switch will therefore be ignored when –n is used.

Process Priority

When the program checks for an event from the operating system (e.g. to react to user input), it can put itself to sleep for a specified period of time. This gives other applications more processor time, but limits the performance of AcqirisLive in terms of maximum acquisition rate. The default is not to go to sleep, but this can be overridden to allow better performance for other applications. Note that this sleep policy is only in effect while the acquisition is running. When the acquisition stops, the sleep policy is always reset to the longest sleep period.

Acquisition Interrupts

When performing acquisitions, there are 2 possible ways to wait for the acquisition to complete: *polling* or using a *hardware interrupt*.

- **-p Polling**: AcqirisLive runs as a single thread process. After an acquisition is started, the instruments are regularly polled to check when the acquisition is complete. The user interface is still alive, but the latency for reading the data after the acquisition may vary.
- **-i Hardware interrupt**: In this mode, AcqirisLive is run as a multi-thread process. After starting an acquisition, a new thread is created to wait for the hardware interrupt indicating that the acquisition completed. This thread is put to sleep, and wakes up upon reception of the interrupt from the instrument, or after a 2 seconds timeout.

Please note that switching the DMA data transfer mode off precludes the use of acquisition interrupts. The –i switch will therefore be ignored when –n is used.

Transient Recorder mode

The application will start in the Transient Recorder mode as opposed to the oscilloscope mode. In this case, if a file name of an AqConfig setup file is given on the command line it will be loaded.

Simulation Mode

Simulation mode allows you to run AcqirisLive without having any digitizer installed in the PC.

Temperature Update

The internally measured temperature of the currently selected module is normally displayed. Using this switch turns this feature off.

Acquisition State

This switch turns on the display of the current acquisition state (Stopped, Ready, Started, Reading, Data ready). This is helpful when running with time-consuming settings (e.g. many segments overlaid, many channels, large records, etc.), but will slow down the overall performance.

Multi-instruments

By default, AcqirisLive tries to detect instruments connected through AS bus, and will initialize any connected digitizers as a multi-instrument. This behavior can be inhibited by the -x switch, in which case any AS bus connector will be ignored.

5. Running the GeoMapper Application

5.1. Who needs a Geographical Map of Modules

The GeoMapper application gives the user the possibility of telling the Acqiris driver crucial details of the physical position of modules when this information cannot be deduced directly. It allows the driver to correctly adjust trigger and clock delays between the different modules of an AS bus 2 multi-Instrument and arrange the modules in an intuitive order.

The GeoMapper application has been implemented as a Wizard with the goal of learning the physical position of each module of a multi-bus system. The driver already knows the logical Bus and logical Slot numbers of each Acqiris unit present. However, because of varying conventions for the compactPCI slot arrangement on a bus, this is not sufficient to determine the physical position. Furthermore, with the aid of the map, the software can ensure that the modules of an Auto-defined multi-Instrument will be ordered to correspond to increasing physical slot number.

⚠ ***NOTE:*** The unusual slot numbering convention of the CC121 is documented in the CC121 CompactPCI Crate User Manual. The CC10X crates have a simpler slot numbering convention that the Acqiris driver already takes into account. CompactPCI Crates from other manufacturers represent an unknown element.

⚠ ***NOTE:*** The GeoMapper is of use for some AS bus 2 systems in CC121 crates and, perhaps, crates from other manufacturers. CC121 crate configurations with both an Acqiris acquisition module in one of the last 7 slots and with the PC running under Windows 2000, NT, or XP will not need the GeoMapper. Users who do not need GeoMapper do not need to read this chapter any further.

5.2. When should the GeoMapper Application be used

The application needs to be used whenever the bus or slot configuration of the system changes in a fundamental way. The most obvious trouble symptom is that an expected multi-Instrument was not found. Alternatively the driver can issue error messages that the AcqirisLive application and other programs will see. Among them are

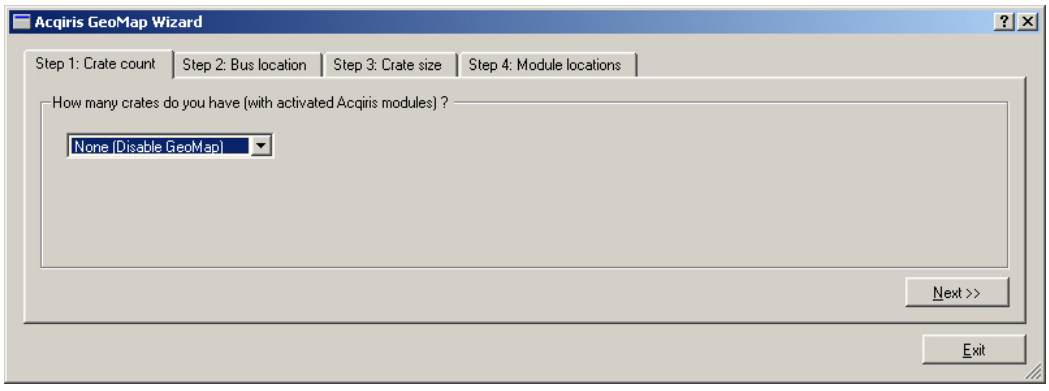
Modules are not contiguous in AS bus 2 combination	ACQIRIS_ERROR_MODULES_NOT_CONTIGUOUS
AS bus 2 Candidate Modules not on same bus	ACQIRIS_ERROR_MODULES_NOT_ON_SAME_BUS
'AcqGeo.map' file is invalid or corrupted	ACQIRIS_ERROR_INVALID_GEOMAP_FILE

In all of these cases the GeoMapper application should be run to ensure that the map file is up to date.

If desired the GeoMapper application will generate a default configuration in which it allows the driver to make all of the choices. This is done by specifying "None (Disable GeoMap)" as the desired configuration in "Step1: Crate count" of the application.

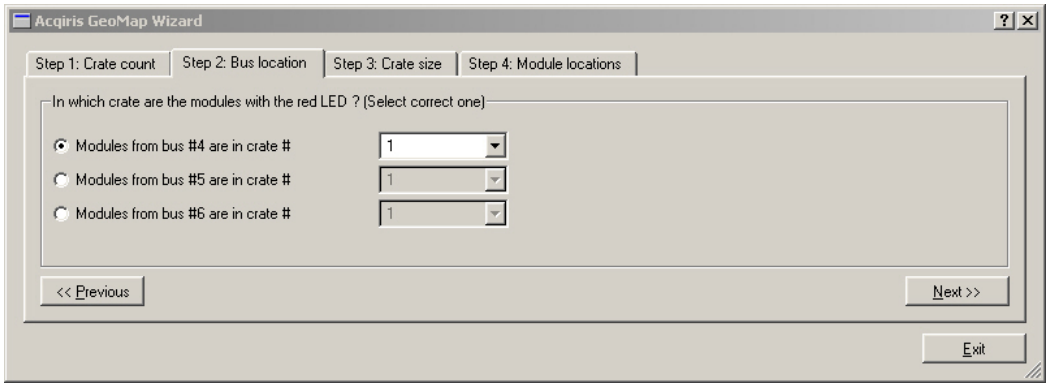
5.3. How to run GeoMapper

After software installation you will find GeoMapper in the AcqirisApp directory of the installation directory. After being started the program will learn about the Acqiris devices present and then show a screen like the one below:


Acqiris GeoMap Wizard
Step 1: Crate count
Step 2: Bus location
Step 3: Crate size
Step 4: Module locations
How many crates do you have (with activated Acqiris modules) ?
None (Disable GeoMap)
Next >>
Exit

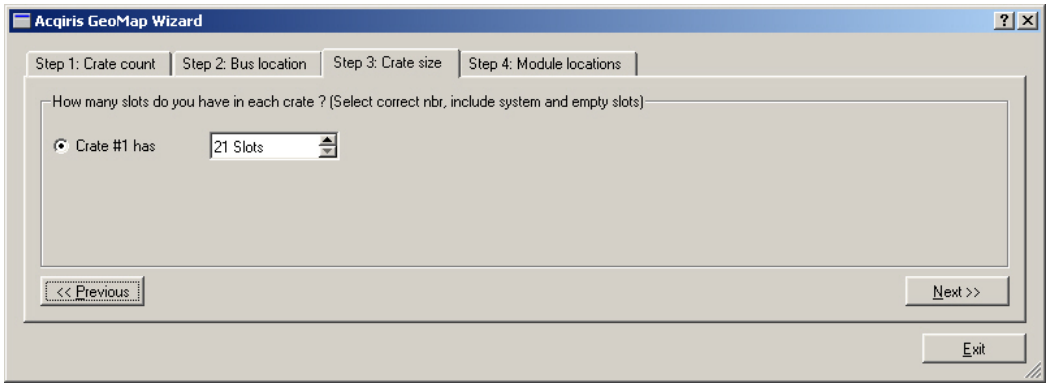
The choice of the number of crates ranges from None up to the number of bus segments that the driver has found containing Acqiris modules. If you choose None and save the resulting AqGeo.map file the system will behave in its natural way without any additional user provided information. If you want to give the driver information on the physical position of modules you should select the appropriate number of crates. If the number of crates does not correspond to your expectations you may have hardware problems (unpowered, broken, or badly cabled crates or modules).

The next step is to associate each bus segment with a physical crate. The menu to do this is shown below:

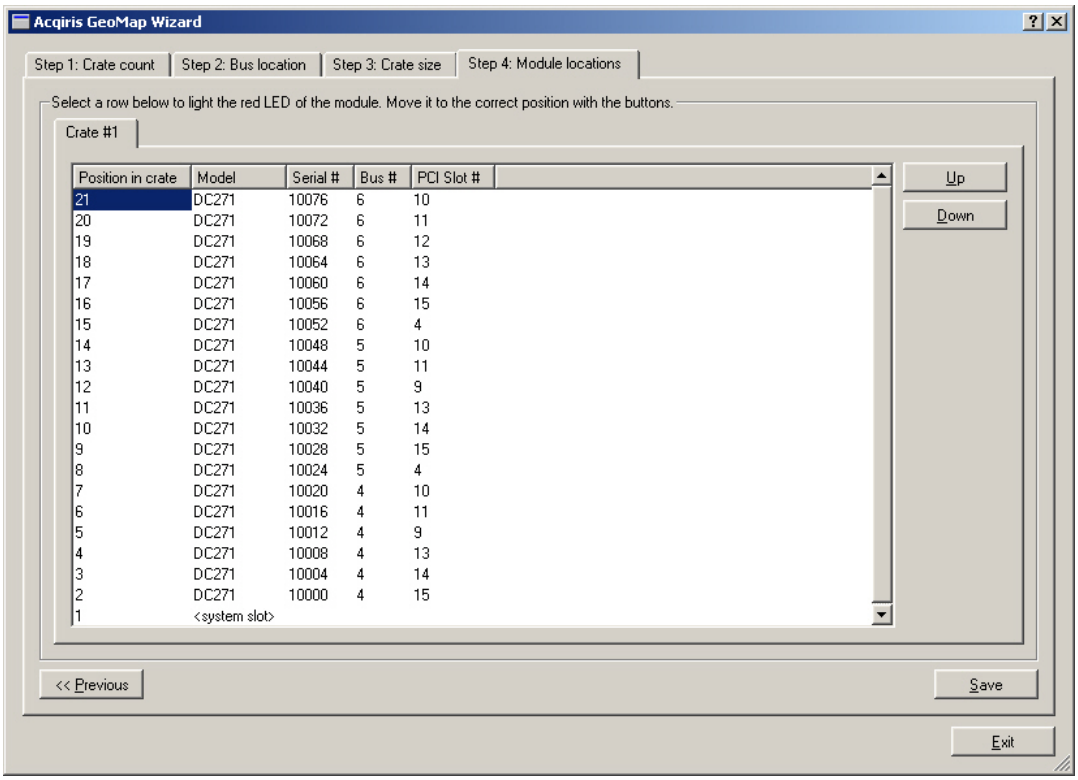

Acqiris GeoMap Wizard
Step 1: Crate count
Step 2: Bus location
Step 3: Crate size
Step 4: Module locations
In which crate are the modules with the red LED ? (Select correct one)
Modules from bus #4 are in crate #
1
Modules from bus #5 are in crate #
1
Modules from bus #6 are in crate #
1
<< Previous
Next >>
Exit

Selecting a row will cause all of the LED's of modules in that Bus to be turned on RED. This should make it easy to identify which crate the modules are in.

The third step is to specify the number of slots in each crate. This is shown below:


Acqiris GeoMap Wizard
Step 1: Crate count
Step 2: Bus location
Step 3: Crate size
Step 4: Module locations
How many slots do you have in each crate ? (Select correct nbr, include system and empty slots)
Crate #1 has
21 Slots
<< Previous
Next >>
Exit

The 4th step consists of arranging the modules of each crate into the correct order. The menu shown below is one in which all of this work has been done for the modules of a fully populated CC121. Selecting a position will cause a module to have its red LED turned on. Then the Up and Down buttons will allow you to move the module in question to the desired "Position in crate".


Acqiris GeoMap Wizard
Step 1: Crate count
Step 2: Bus location
Step 3: Crate size
Step 4: Module locations
Select a row below to light the red LED of the module. Move it to the correct position with the buttons.
Crate #1
Position in crate | Model | Serial # | Bus # | PCI Slot #
21 DC271 10076 6 10
20 DC271 10072 6 11
19 DC271 10068 6 12
18 DC271 10064 6 13
17 DC271 10060 6 14
16 DC271 10056 6 15
15 DC271 10052 6 4
14 DC271 10048 5 10
13 DC271 10044 5 11
12 DC271 10040 5 9
11 DC271 10036 5 13
10 DC271 10032 5 14
9 DC271 10028 5 15
8 DC271 10024 5 4
7 DC271 10020 4 10
6 DC271 10016 4 11
5 DC271 10012 4 9
4 DC271 10008 4 13
3 DC271 10004 4 14
2 DC271 10000 4 15
1 <system slot>
Up
Down
<< Previous
Save
Exit

The final step is to actuate the Save button so that the final configuration will be memorized and made available to the driver.

The GeoMapper application will always work with the standard AqGeo.map file. If you need to have several such files corresponding to different configurations it is up to you to either rename the files or transfer them to other directories in an appropriate manner.

6. Appendix A: U1093A-AS5 AS bus 2 for CompactPCI/PXI Digitizers

Specification and User Instructions

SPECIFICATIONS :

AS bus 2 Bridges allow the connection and synchronization of up to 5 identical 10-bit CompactPCI U1065A (DC222, DC252, DC282) or 3 identical PXI digitizers U1062A (DC122, DC152).

Clock synchronization accuracy : ±500ps.

USER INSTRUCTIONS :

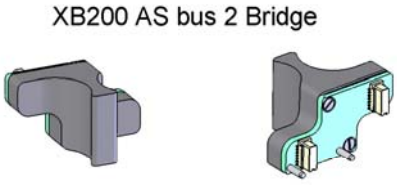
Bridges can be installed/removed on units when they are powered. An application using the digitizers must be restarted after such changes are made.

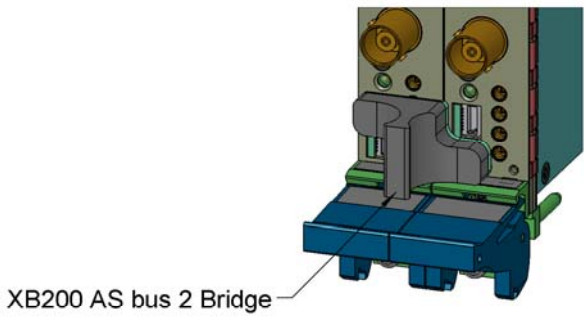
Install/Remove the U1093A-AS5 XB200 AS bus 2 Bridges as follows :

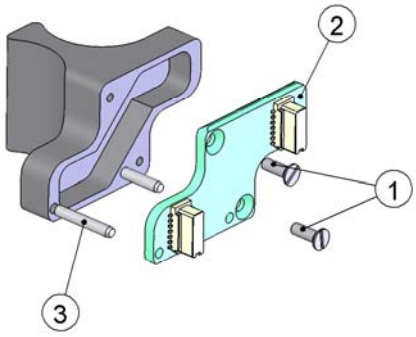
- Make sure that the screws securing each of the modules to the crate are not completely tightened.
- Before inserting the XB200, manually adjust any difference in the module separation, such that the distance between the center of the connnectors corresponds to that of the XB200.
- Carefully insert/remove the XB200 bridges between each pair of modules. Force should not be required.
- Tighten the screws of each of the modules.
- If desired, add an U1093A-AS7 XB104 Retainer on each handle to secure the AS bus 2 bridge against vibration.
  It clicks into place when fully inserted. It can be easily removed by pulling on the lower half of the Retainer while sliding it off.

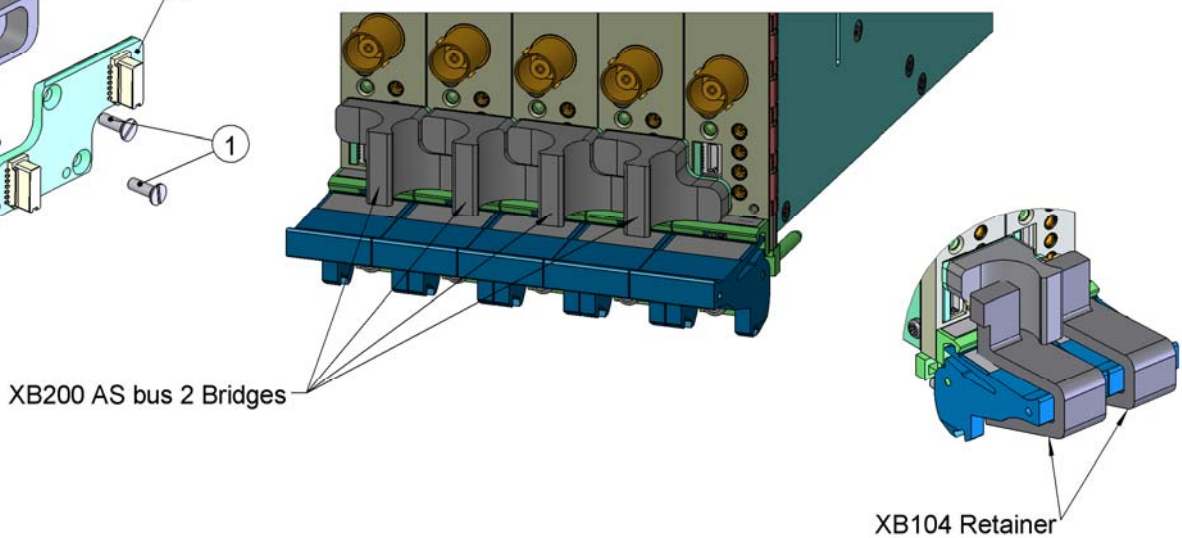
Modification of XB200 AS bus 2 Bridges for use on older modules.
An earlier version of the Bridge was foreseen with only one positioning pin. If needed,

- Remove the two screws 1)
- Remove the Printed Circuit Board 2)
- Pull the positioning pin 3)
- Reassemble the Bridge







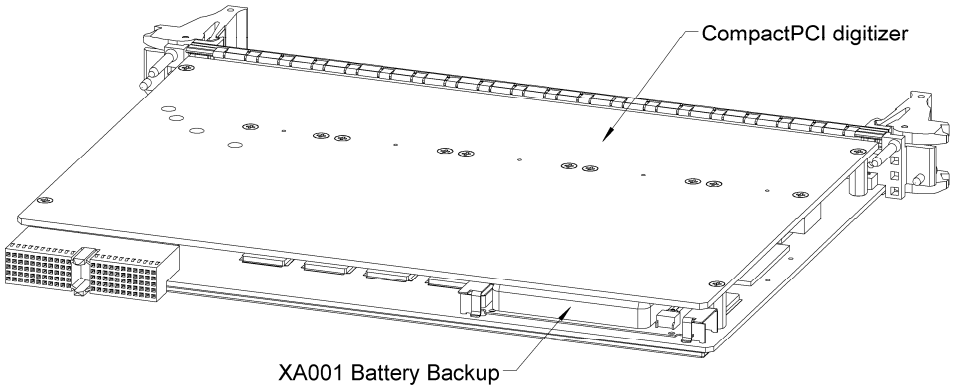


7. Appendix B: XA001 Battery Backup for CompactPCI Digitizers

Specification and Assembly Instructions - BB1 Option

SPECIFICATIONS :

Please refer to the user manual for more detailed information on the use of the battery backup.
Time to charge the battery : <2.5 h (digitizer powered)
Backup duration time : without long memory option : >120 h
with long memory option : >12 h
Lifetime : 75% of battery capacity after 500 cycles



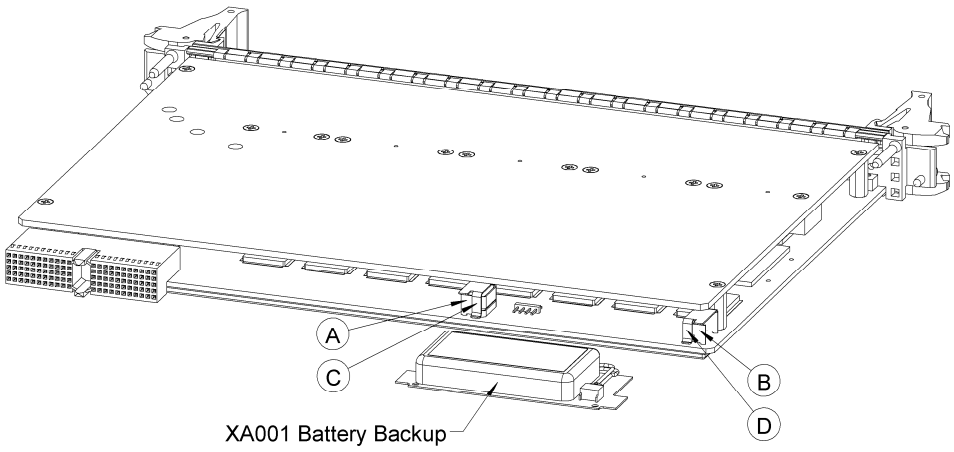
ATTENTION :

The CompactPCI digitizer must always been powered off before either introducing or removing the battery backup and care must be taken in order to avoid electrostatic discharges.

The following steps are necessary to install the battery backup XA001 into a CompactPCI digitizer :

1. Position the battery backup between the guides "A" and "B" insuring that the orientation matches the figure below.
2. Lift the two strips "C" and "D" in order to introduce the circuit board of the battery into the guides "A" and "B".
3. Push the battery in the direction of the card until it hits the stop blocks and ensure that the strips "C" and "D" are correctly and securely attached.

Proceed in the reverse order to remove the battery.



8. Appendix C: U1092A-HVB XA100 BNC Input Overvoltage Protection

Specifications and User Instructions

The XA100 Acqiris option contain two elements :
- 3dB BNC Attenuator
- 90V BNC Spark Gap

The XA100 overvoltage protection kit allows the digitizers with 50 Ohm only input (without high impedance input) to withstand a high voltage surge of up to 5 kV.

XA100 SPECIFICATIONS :

- Frequency range : DC to 1GHz
- Input impedance : 50 Ohm
- Attenuation : 3 dB
- VSWR, DC to 1GHz : < 1.25
- Impulse discharge current (8/20 us pulse) : 10 kA
- Weight : 60 g
- Length : 85 mm

ATTENTION :

- BOTH the 90V spark gap and the 3dB attenuator MUST be used in order to absorb very high current.

- In order to limit the input current, the attenuator MUST be inserted between the spark gap and the input of the module, as shown in the figure below.